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MOTORSHIP

Trade Mark, Registered

South Ferry Building
NEW YORK, N. Y.

L. C. Smith Building
SEATTLE, WASH.

PUBLISHED MONTHLY IN THE INTERESTS OF COMMERCIAL AND NAVAL MOTOR VESSELS
AND FOR RECORDING PROGRESS OF THE MARINE
INTERNAL-COMBUSTION-ENGINE

Publisher—MILLER FREEMAN Editor—THOS. ORCHARD LISLE Manager—RUSSELL PALMER

A. M. S. Naval Engineers. A. M. I. Marine Engineers

Subscription rates: U. S. A. and Mexico, $3.00 per year. Canada and foreign countries in the postal union, $3.50. Single copies, 25c.
"Motorship" is published on the 25th of the month, and all changes in and new copies for advertising must be in the hands of the publisher prior to the 5th of each month. Notice of discontinuance of advertising must be given before the 1st of the month, preceding issuance.

January, 1919 Vol. 4 No. 1

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The oil-engined motorship has arrived! It is such a pronounced economy that it was bound to come. Nothing could stop it! And all obstacles have been removed as fast as they arose. The law of progress has seen to that. Very strong prejudices stood in the way of steam. But, one after another they were swept aside and steam reigned triumphant for a century. Steam now has had its day! Its zenith has passed, and gradually but surely it is being superseded by the economical internal-combustion power. America, the most important oil-producing country, is to be the greatest motorship-owning nation. Let us all co-operate and assist to make that day soon

EDITORIAL

CHAIRMAN HURLEY A STRONG ADVOCATE OF MOTORSHIPS—A GREAT FUTURE FOR AMERICA'S NEW INDUSTRY.

THOSE "dyed-in-the-wool" steamship builders who have regarded the Diesel-driven motorship as a sort of elaborate toy; as the conception of an over-enthusiastic mind; or an undeveloped invention ahead of its time, and who in consequence of their views have made no preparations for the construction of high-powered, heavy-oil burning internal combustion engines, may receive a distinct shock when they read on another page the open acknowledgment of Mr. Edward N. Hurley, Chairman of the U. S. Shipping Board that the Diesel-engined motorship is vastly superior to the steam-driven vessel and that its construction is of great importance to America.

Even to us this public acknowledgment came as a surprise, altho' we believed that during the last few months, both the Shipping Board and the Emergency Fleet Corporation have been unusually active in their motorshipping investigations. While, of course, we have not been privileged to make any definite announcements of the possible programme, we have thrown out sundry suggestions regarding what obviously was bound to come, which should have been sufficient warning to the thinking business man. Chairman Hurley's announcement in our last issue also was very significant.

Five of America's largest steel shipbuilding companies, namely: The Newport News Shipbuilding & Dry Dock Co.; The Wm. Cramp & Son Ship & Engine Co.; The Bethlehem Steel Co.; The New York Shipbuilding Corp.; and The Submarine Boat Corp., all are properly prepared to handle motorship construction, and very soon will be starting,—naval ship pressure being the only retarding factor. A few weeks ago a leading official of one of these companies stated to us—"If America does not build motorships her merchant marine will be driven off the ocean!"

Chairman Hurley says, "The motorship is here!" * * * "With the motorship we can have an entirely new era in ocean transportation!" * * * "The coal-burner spent 117 days in port; the motorship spent 96 days in port!" * * * "Look a little further ahead and design your ship to run with internal-combustion engines of the Diesel-type!" * * * "With the motorship and American inventive genius and energy we have reasonable prospects of again carrying our own exports and imports!"

Lastly, may we advise every steamship and steam-engine builder to prepare as rapidly as possible by either securing the experiences of some proven European Diesel-engine, or else engage expert Diesel engineers and design and develop their own motors. The words in italics above this editorial are a true indication of the situation, as is endorsed by Mr. Alba Johnson in a letter elsewhere in this issue.

SHIPPING BOARD REMOVES BAN AGAINST BUILDING FOR PRIVATE ACCOUNTS

ANNOUNCEMENT was made on Dec. 6th, 1918 by the United States Shipping Board that American shipbuilders may accept contracts for the building of wooden vessels either for **domestic** or **foreign** account without the necessity of making any prior application for permission to the Shipping Board. In other words, so far as wood ship construction is concerned the American shipbuilder is now in a position to solicit and accept orders and carry forward the work of construction and to enter into contracts for the sale of such ships on completion without restraint.

The same action was announced with reference to the building of steel ships on domestic orders, except that it does not embrace or apply to foreign orders for steel tonnage.

We would remind shipowners that there now exists an excellent opportunity to make early bookings for new motorships, because several builders of steel vessels soon will be in the position for acceptance of orders for delivery of hulls towards the end of 1919 and even earlier, while there are a number of responsible marine oil-engine manufacturers who can take orders now. Giving them plenty of time will produce better motors and will facilitate the training of good operators.

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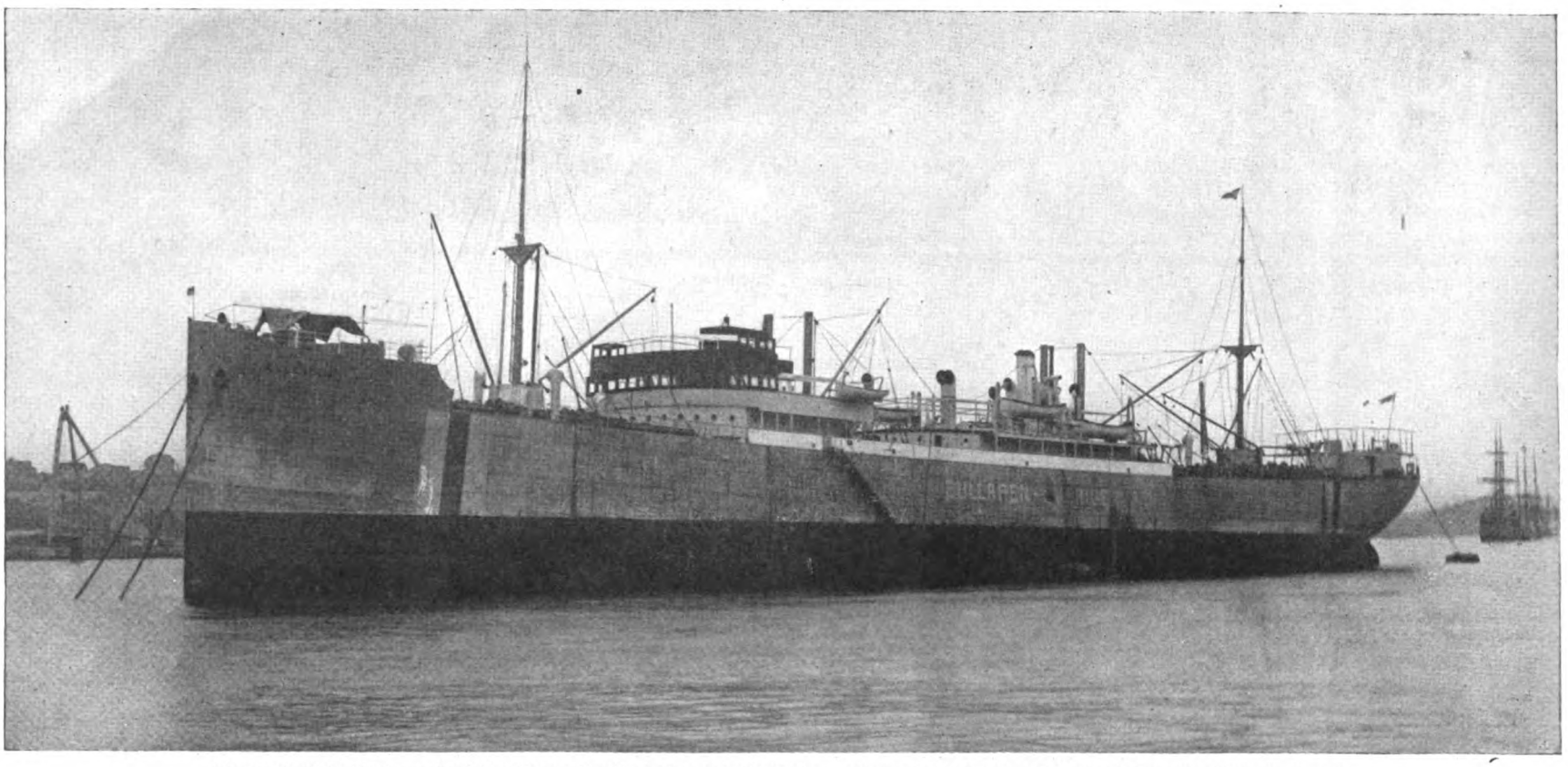

The motorship "Bullaren" of the Transatlantic Line of Gothenburg. She is the largest merchant vessel ever built in Sweden

New 13-Knot Swedish Cargo and Passenger Motorship

First of a Fleet of Eleven High-Powered Diesel-Driven Vessels Visits New York—Impossible for United States *Steamers* to Compete With Such Economical Cargo Carriers—Important to Interests of Nation That the U. S. Shipping Board Changes the Shipbuilding Programme from Steam to Motor Power

By THE EDITOR OF "MOTORSHIP"

WHILE our worthy and energetic head of the U. S. Shipping Board is in Europe, endeavoring to raise the European standard of wages up to the American standard, enterprising European shipowners are constructing—as fast as they can obtain materials—economical oil-engined steel motorships against which it will be impossible for our coal and oil-fired steamers to compete in the world's markets, regardless of the standard of wages that their owners eventually may pay.

True it is that 72 Diesel-Engines of 750 B.H.P. each have been ordered, as was indicated by Mr. Chas. Piez, of the Emergency Fleet Corporation, in our last issue; but we believe it is highly important to order many additional Diesel engines as quickly as possible, and such engines should be about 2,000 I.H.P. each. They will be suitable for twin-screw, 14-knot vessels of about 8,500-ton d.w.c. The Diesel engines on order for large motorships for Scandinavian owners represent a value of about $33,110,000.00, this being represented by 236,500 B.H.P., and does not include the oil-engines for smaller coastwise vessels.

What also is needed is a cancellation of every steam-engine and boiler up to 6,500 I.H.P. sizes (twin-screw), where actual work of extent has not yet been commenced, and substitute the orders for Diesel-type engines. That this is important to the interests of the nation was indicated clearly by Mr. Hurley himself prior to his departure for France, as published on page 7 of the December issue of "Motorship" and again in this issue.

Also the visit of the new Swedish motorship "Bullaren" to New York has impressed us more than ever with the necessity of turning the country's entire ship and engine-building energies to the production of motorships; otherwise such steam-driven vessels as are now on order will be confined to coast-wise routes as before the war, leaving the world's commerce to be carried by the ships of other nations. Our steamships will not be able to carry even the maximum share of our own products to foreign countries, because European motorship owners will be able to offer much lower freight rates, and shippers naturally will send their goods by the cheapest route, patriotism or no patriotism. All Americans like to be patriotic, of course; but, in times of peace and competition, businesses are not run on patriotism alone. Towards constructing the ms. "Bullaren" the Swedish Government loaned her owners $139,000.00; and loaned the North Star Company of Stockholm $238,-500.00 towards building two motorships.

Aboard the motorship "Bullaren" with us were two representatives of one of the largest American steamship companies, who now are implicitly converted to Diesel-Engine power, but who were powerless to build motorships because of Federal control of the shipyards, and who cannot convert their existing steamers, because all are chartered to the Government.

During the stay of the "Bullaren" she was visited by many other shipping men and by U. S. Shipping Board and Emergency Fleet Corporation officials. All were most enthusiastic over this fine vessel.

Let it be pointed out that the ms. "Bullaren" is but the first of a fleet of eleven 13-knot motorships of the same size building for the Redericktiebolaget Transatlantic of Gothenburg, Sweden, who have entirely abandoned further steamship construction. Yet they are experienced steamship owners, as, in addition to the ms. "Bullaren," they own a fleet of 41 steamers aggregating 170,-000 tons d.w.c. The new motorship and her ten sisters, on order, will bring their fleet up to 289,500 tons d.w.c. This represents an annual transatlantic cargo-carrying capacity of about five-and-a-quarter millions of tons, assuming each ship will make nine round voyages per annum. Quite a little factor to contend with, especially if they convert their existing 41 steamers to Diesel power, which, we believe, they undoubtedly will do if the success of their first motorship is a weighing factor.

The second motorship, the "Tisnaren," is almost ready for trials, and the third vessel is partially completed; so, under the difficult material supply condition, excellent progress is being made with the construction of the new fleet.

At the same shipyard as these motorships are being built, are two large Diesel-driven ships for Axel Johnson, of the Nordstjernan (North Star) Line, who already has several in regular operation; and there is another building for the Swedish-American Line. These, in addition to the big fleet of Diesel-driven motorships building for Norwegian owners listed on page 29 of our last issue. This means that altogether there are 44 large motorships on order for Scandinavian owners.

This total represents about 78 main Diesel oil-engines aggregating about 214,500 B.H.P., and about 100 auxiliary Diesel-Engines aggregating about 12.000 B.H.P., and making a total of 236,500 B.H.P., which makes the U. S. Emergency Fleet Corporation's recent order look small in comparison with the size of the respective countries.

However, as soon as more money is ap-

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propriated by Congress we anticipate that the Emergency Fleet Corporation will place orders for many additional Diesel engines of higher power for larger and faster freighters, and we have reason for hinting that an application by the Shipping Board for funds for this particular purpose will meet with a very favorable reception at the Senate, so the chances are good for securing a sufficient sum to build quite a fleet of motorships. Consequently, if in addition some of the existing orders for steam machinery are changed to Diesel engines, America soon will be the world's greatest motorship owning nation, which as a great oil-producing country is her natural position.

This is the second visit of the ms. "Bullaren" to New York; but, when she previously came here, we did not have the opportunity to see her. She started on her maiden voyage on June 30, 1918, since when she never has had an engine trouble, either with the main motors or auxiliaries, with the exception of the bursting of a compressed-air pipe of small diameter due to defective material. No cylinder, cylinder-head, piston, crankshaft fractures or cracks have occurred, the plain truth being that she has been far more reliable than the average steamship, thus "smashing-on-the-head" the theory that all motorships are unreliable and suffer continuously from break-downs. At the time of our visit her log showed a total run of 11,807 miles at an average speed of 10.66 knots. Her propellers are of cast-steel but will be changed to bronze soon, which will increase her speed.

Being the first Diesel ship built at this yard, it was decided to "nurse the engines" for a voyage or two, which, of course, is quite a wise decision; but, on the return to Sweden her chief-engineer fully expects to average 13 knots for the entire distance with the ship completely loaded, which will be quite possible, seeing that a speed of 14 knots has been attained without forcing the engines. Up to the present time the best day's average speed has been 11.7 knots, loaded, on a fuel-consumption of 12.2 tons (86 barrels) of fuel-oil. Her speed on trials averaged 13.5 knots.

We may mention that she has accommodation for 12 passengers almost equal to that on the finest of giant transatlantic liners, only the handsome saloon and cosy smoking-room being on a much smaller scale. There even is an I. L. Malmsic (Stockholm) piano in the saloon. The captain has unusually attractive quarters, including a large cabin and adjoining sleeping-room. The ship is heated by electricity and by steam. The engines of the next ship will be controlled and manoeuvred by the navigator on the bridge.

It will not be amiss to turn to the dimensions of the vessel and her motor machinery. She is a steel-built twin-screw ship with three decks and a shelter deck, two masts, five large cargo-holds with six hatches. Her stern is of the cruiser type. The machinery is arranged amidship, and there is a very small funnel for the exhaust-gases. Personally, we think the older arrangement of carrying away the exhaust gases through one of the masts is preferable; but in this case both the masts are too far away from the engine-room to allow of this arrangement. However, as the bridge is at least 100 ft. forward of the funnel, the exhaust-gases are not of annoyance to the navigating officers. Her leading dimensions are as follows:

Length O. A.	440 ft. 0 in.
Length B. P.	425 ft. 0 in.
Breadth	56 ft. 0 in.
Depth	38 ft. 0 in.
Draught (loaded)	26 ft. 0 in.
Tonnage (D.W.C.)	9,500 tons
Maximum cargo yet carried (including 1,300 tons of oil-fuel of which 400 tons was discharged in Sweden as cargo)	9,400 tons
Cruising radius (1,300 tons fuel)	120 days
Daily fuel-consumption (loaded)	12¼ tons
Ship's speed	13 knots
Best speed attained	14 knots
Oil-fuel used	27 to 28 deg. gravity (or 0.845 specific gravity)

Name of fuel.....Standard Co.'s Diesel-Engine Oil

Heavier oil has been bunkered for voyage to Buenos Aires.

Horsepower	4,000 I.H.P.
Number of cylinders per engine	6
Bore and stroke	740 mm. (29.134 in.) by 1,100 mm. (43.307 in.)
Engine speed	100 R.P.M.

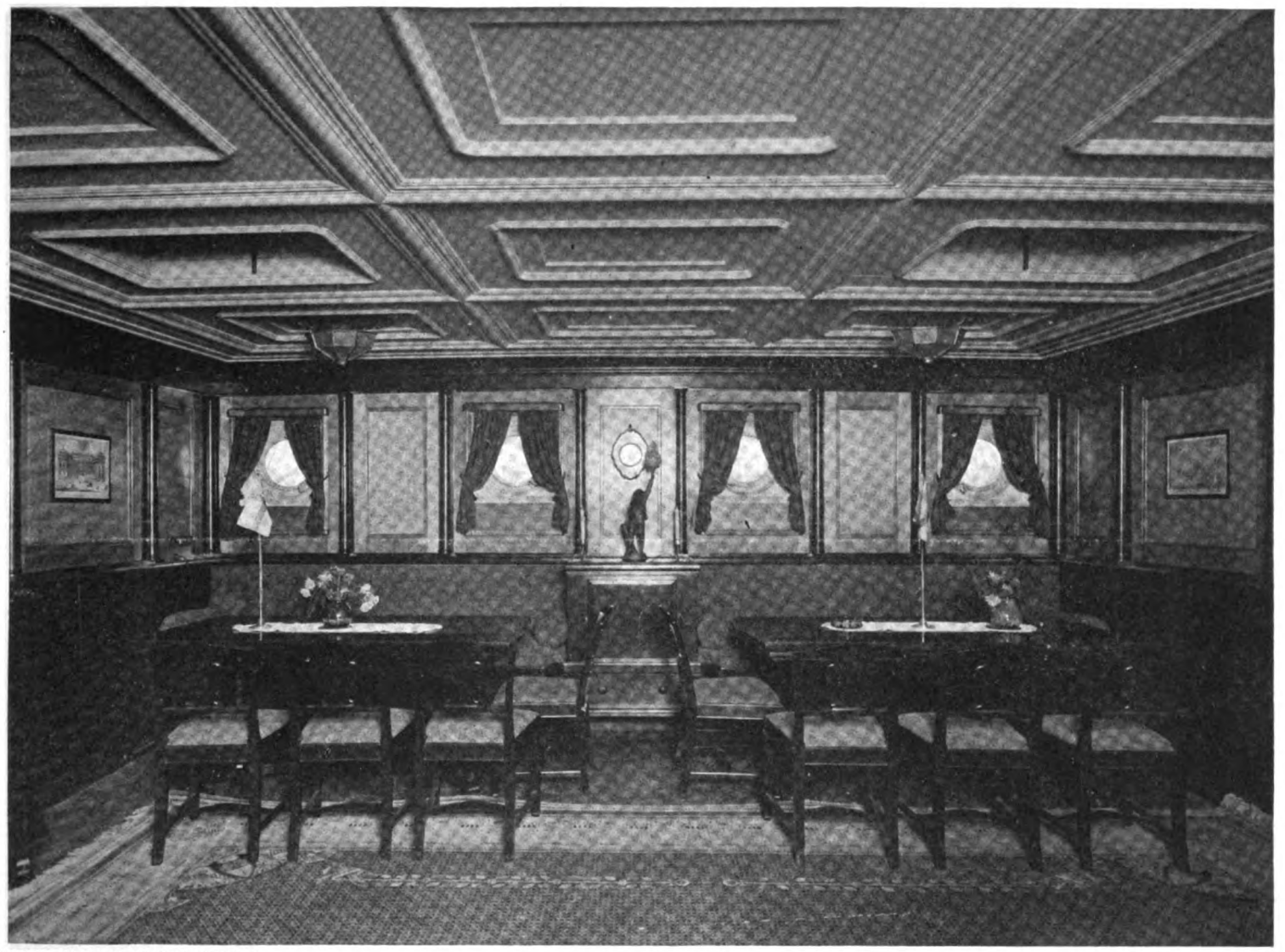

Photo. Underwood & Underwood.

Part of the beautiful passengers' and officers' dining-saloon on the motorship "Bullaren"

Propellers (4 blades),
13 ft. 1½ in. dia. by 13 ft. 1½ in pitch and 5 3-3 sq. ft. developed area.
Fuel-consumption per I.H.P.....133 grammes
Builders of hull.....Gotaverken, Gothenburg
Builders of Diesel-Engines.Gotaverken, Gothenburg
Type of Diesel-Engine,
Burmeister and Wain four-cycle, single-acting

We will give a brief resumé of her voyages up to the end of November; but, by the time this appears in print, she will be en route to Buenos Aires, thence to Sweden via Trinidad. Her voyages to New York have been via Bergen, which means a long run close in shore with many stops, and anchorings and reduced speeds, which, of course, lower the average speed for the entire voyage. At one period she was held up in America six weeks waiting for a license to sail. Also the cast-steel propellers are a retarding factor.

She left Gothenburg in ballast for her

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maiden trip on June 30th, and arrived in New York on July 16th, thus completing the voyage in the excellent time of 16 days. The total distance was 4,176 nautical-miles, and the average speed was 11.0 knots. Her engines averaged 3,621 I.H.P. at 100 R.P.M. on a fuel consumption of 12.1 tons (85 barrels) of oil-fuel per 24-hr. day for all purposes. The lubricating-oil consumption was particularly low, being about 12 gals. per day.

Her return was fully loaded, also via Bergen. She left New York on August 27th, and arrived in Gothenburg on September 12th. Very rough weather was experienced, and for two days in the North Sea she was obliged to proceed slowly with just steerage way. This reduced her average speed for the voyage to 10.45 knots for the distance of 3,849 nautical-miles. She had aboard 8,100 tons of cargo and 1,300 tons of fuel-oil; but, of this fuel she discharged 400 tons as cargo in Sweden, and still had more than sufficient fuel left to bring her back to America, so she really carried 8,500 tons of cargo. What steamer of her dimensions could have done this? Her engines averaged 3,958 I.H.P. at 101 R.P.M., on 12.2 tons of oil-fuel, and 10 gallons of lubricating-oil per 24-hour day. Under the existing weather conditions many a steamship of her power would have found it exceedingly difficult to have averaged this speed. The New York to Bergen section of the run was made in 14 days without a single stop of either Diesel-engine.

On the voyage back to New York she again was in ballast. She averaged the 3,782 miles logged at 10.55 knots on a daily fuel-consumption of 12.2 tons.

From the foregoing data it will be understood that the ms. "Bullaren" needs less than 400 tons of fuel-oil for a complete voyage to Gothenburg and return, including all port consumptions. Her consequent economy hence is obvious. If she has a heavy cargo, and not a light, bulky one, such as cotton, she would have a tremendous carrying capacity for her size if only about 500 tons of oil were bunkered. This would enable her to lift at least 8,900 tons each way, in addition to fuel and stores, and she would have more than enough fuel for the return journey.

In the engine-room there are 17 men altogether, the total crew of the ship being 43 officers, engineers and crew. The engine-room staff consists of Chief-Engineer C. A. Hansen, six engineers, nine motormen, and one electrician. Axel Hansen is the second-engineer, and the third-engineer is Ernest W. Assarsson. All seem to speak English fluently. The Chief is an experienced marine steam man who received his Diesel training in the builder's works while the "Bullaren's" engines were under construction. He is exceedingly pleased with the operation of the motors, and says they will work with complete reliability, but need to be watched with more care than steam engines. Captain Oscar Huldtgren considers that the ms. "Bullaren" is the finest ship he has ever commanded, and is most enthusiastic over her performances. C. J. Johansson is the First-engineer.

For maximum running without grinding the exhaust-valves, the period is 50 days; but the exhaust-valves are ground every 30 days. At the time of our visit one of the auxiliary engines had been running for 16 days without touching.

Turning to the two big main Diesel-Engines, which together develop 4,000 I.H.P. at 100 R.P.M., or 333 I.H.P. per cylinder, these follow very closely Burmeister and Wain engines that have been built during the last two years. Each has six cylinders, 29.13 in. bore by 43.30 in. stroke, and operates on the four-cycle, single-acting principle, and is direct-reversible. Each drives a four-bladed propeller of 13 ft. 1½ in. in diameter by the same pitch measurement. The propeller-shaft has a diameter of 342 mm. (13.4 in.)

Each engine is divided into two sets of three cylinders, with the jackets cast en bloc. The engines of the ms. "California," described elsewhere in this issue, have the cylinder jackets cast separately, as have earlier engines of B. & W. design. The newer arrangement affords more effective cooling. Between each set of cylinders are the controlling mechanisms.

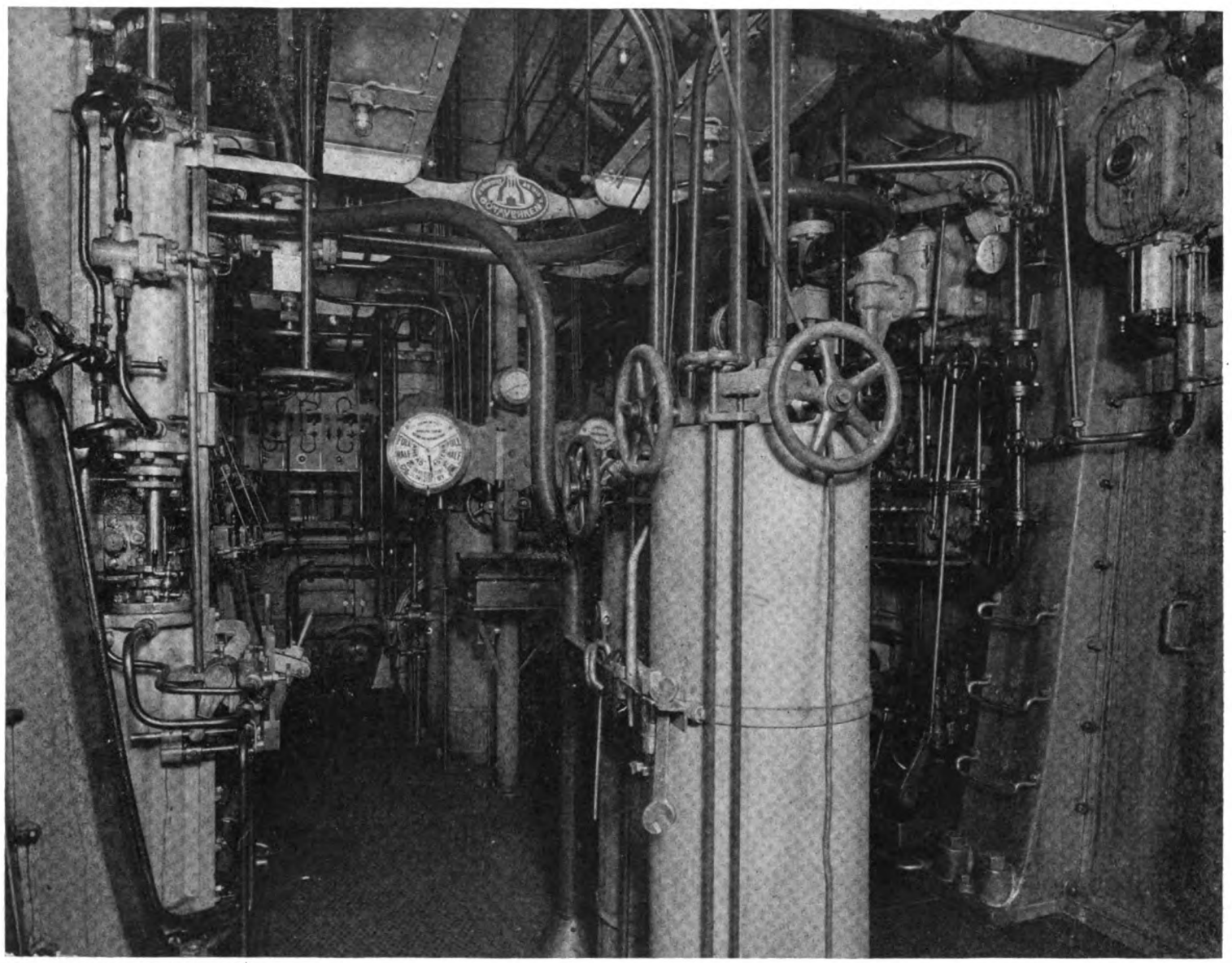

Photo. Underwood & Underwood.

The control-station in the engine-room of the motorship "Bullaren." In the center foreground are the compressed-air storage bottles for the injection of fuel. The engines shown were built under license.

As is consistent with the latest B. & W. practice, there is a three-stage air-compressor with coolers, and inter-coolers arranged at the forward end of the engine and driven off the crankshaft. This is different from the engines of the "California," with which only the high-stage compressors are driven off the main engines. Furthermore, the "California's" motors have oil-cooled pistons; but in the "Bullaren" the pistons are cooled by salt-water. Telescopic-pipes are used for this purpose, and under the cylinders are fitted trays with a drain-pipe to catch the water from the glands which leak a little. This tray also serves to catch the burned lubricating-oil scraped off the walls of the combustion-chamber by the piston-rings. This drops in the form of a hard carbonized powder, and mixes in the tray with water and oil until it becomes a black paste. In the earlier ships this used to drop into the crankcase; but the tray now adopted prevents this. However, we understand that the quantity that drops down is comparatively small.

Box-pistons now are used instead of the long trunk pistons originally adopted. There now is no ring in the upper part of the piston, the first piston-ring starting six inches from the top. With a ring

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Chief-Engineer C. A. Hansen and Captain O. Huldtgren of the motorship "Bullaren." Both men are most enthusiastic over their ship

near the top it was found that it burned and was difficult to lubricate and keep clean.

As the main features of the engines follow previous design, there is no need to go into a lengthy description of the engines themselves, as back numbers of "Motorship" contain the same. However, the diameter of the crankshaft will be of interest. The crank-pins are 453 mm. (17.7 in.), and the main bearings also 453 mm. in diameter. We should estimate that the webs of the crankshaft are about 12 in. thick. The mean indicated-pressure is 6 atmospheres (84 lbs. per sq. in.), the cylinder compression of air being 38 atmospheres (532 lbs. per sq. in.), which is rather higher than with many Diesel-Engines; but, of course, is advantageous for rapid starting in cold weather. Air-injection pressure is 60 atmospheres (1,040 lbs.), and for starting and reversing an air-pressure of 350 lbs. is used.

For the force-feed lubrication of the main engines No. 1 Gargoyle is used, but Vacuum R. R. is used for the air-compressors. As before mentioned, the consumption is about 12 gallons per 24-hr. day. The fuel bunkered for this voyage to Buenos Aires is considerably heavier than the oil previously used.

All the auxiliaries, including the steering-gear winches and windlass, are electrically driven, with the exception of the refrigerating-machinery, a small emergency air-compressor, and a couple of small spare pumps. These latter are furnisred with steam from a small oil-fired donkey-boiler, which mainly is used for supplying the ship with steam heat. The assistant-engineers attend to this boiler. It uses 1,200 to 1,400 pounds of fuel per day, or twice as much as one of the auxiliary Diesel-Engines, and yet only does about half the work. American manufacturers of refrigerating machinery in the past have paid practically no attention to the extensive motorship field; but if no further delay is made much valuable business can be secured instead of letting the same pass into the hands of German firms.

On the front side of the engine-room are three Diesel-Engines of the four-cycle type; but, unlike the marine engines, were built in Copenhagen, Denmark. They are two-cylinder sets, and each develop 120 I.H.P. They are of B. & W. design, and are coupled to 220 volt, 273 amps., 90 B.H.P. generators, which supply the current for the entire ship and deck machinery. Two are used when in port, and only one when at sea. The third set is a stand-by. In port these two Diesel-Engines together use 1,200 lbs. of oil-fuel per 24-hr. day, so that when the ship is in harbor loading or unloading, she uses less than 1¼ tons of fuel, of which the little heating boiler consumes over 50 per cent. No clearer demonstration of the wonderful economy of the Diesel-Engine than this could be obtained. There are 12 Sieurins electric winches, 2 being of 5 tons capacity, and 10 of 2 tons, so the "Bullaren" can load and unload cargo both rapidly and economically, and the electric winches even are more simple for non-skilled labor to operate than are steam winches, and also deck steam piping, lagging, and leakages, etc., are avoided—a great advantage in very cold weather.

There is a great field for American manufacturers of electrical engine-room and deck auxiliaries, both at home and abroad, if they only will keep their name constantly before prospective purchasers by means of judicious publicity, and in order to give a comprehensive idea of what a motorship of this size requires, we made a note of the various auxiliaries in the engine-room. We already have referred to the electrical steering gear, windlass, winches, and to the three big electric generators, so need not repeat them. The electric steering-gear is of Hele-Shaw construction and was made in Great Britain. Our own electrical companies do not yet seem to have realized the market that is open to them for a good machine of this type.

Nearly all the electric motors on the "Bullaren" are of the Asea type, built by the Elektricitets Aktieselskabet Asea, of Copenhagen, Denmark, and the starters on the motors were made by the Allmanna Svenska Electrista Aktie, of Vesteras, Sweden. Seeing that the electric motors were imported into Sweden there seems to be no logical reason why American manufacturers could not secure much of this business mainly by keeping their name before Scandinavian shipowners and shipbuilders, and we may be pardoned for saying that for this purpose no better medium than "Motorship," with its world-wide circulation, could be found. In Norway and Sweden alone there are about 45 motorships of this size on order; and as yet the construction of some of them has not actually commenced, while others soon will be ordered. Each ship has or will have over $50,000.00 invested in electric motors and generators alone, or a total of about 2¼ millions dollars worth of business, which amount soon will be obtainable annually. Will American electrical-equipment manufacturers idly watch this business return to Germany again?

Here is the list of the motorship "Bullaren's" other electric motors:

Fuel Service-Pumps
15 H.P., 220 Volts, 58 Amps. One electric motor.

Ballast Pump
15 H.P., 220 Volts, 58 Amps. One electric motor.

Bilge and Sanitary Pumps (Two)
10 H.P., 220 Volts, 50.5 Amps. Two electric motors.

Turning Engines (Two)
5 H.P., 220 Volts, 25 Amps. Two electric motors.

Cooling-Water Pumps (Two)
20 H.P., 220 Volts, 77 Amps. Two electric motors.

Lubricating-Oil Pumps (Two)
10 H.P., 220 Volts, 39 Amps. Two electric motors.

Large Screw-Cutting Lathe
One electric motor.

Drilling Machine
One electric motor.

The lubricating-pumps are in tandem, two being emergency pumps. The fuel service-pump and its motor are arranged between the two main engines. These pump the fuel-oil from the double-bottoms of the ship to the service supply-tanks in the engine-room.

In the engine-room there were two novel fittings of note, one being an Alfa-Laval separator, similar to the de Laval cream separator, which is used for separating the dirt and water from the lubricating-oil. It's a small hand machine that turns at 45 R.P.M

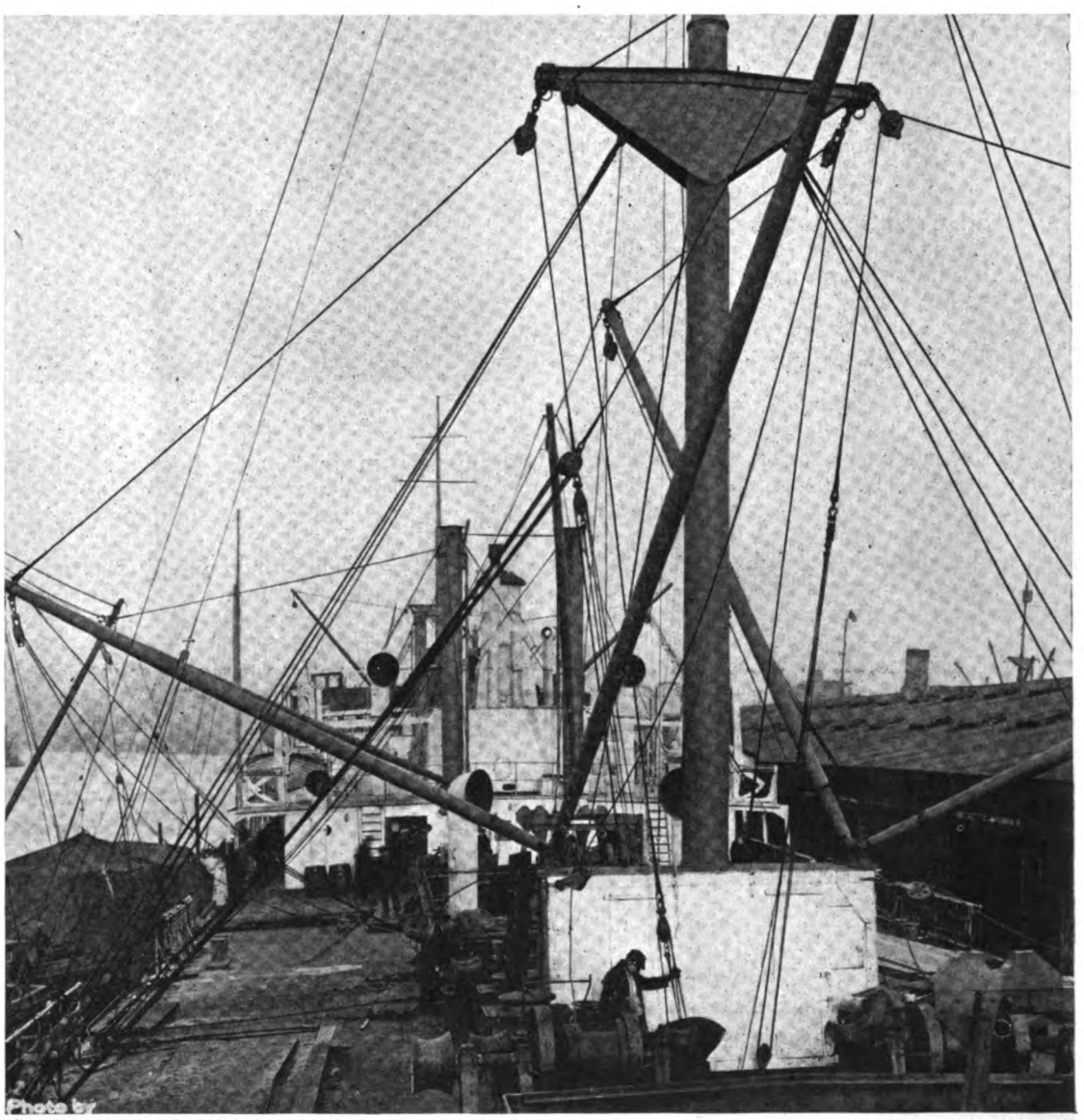

Photo. Underwood & Underwood.

Deck of the motorship "Bullaren" looking forward. Five of the electric cargo-winches can be discerned. With a few exceptions, American manufacturers of winches appear to have overlooked the extensive business there is to be obtained by studying the particular requirements of motorships and by keeping their names before motorship owners.

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It gives excellent results, says Chief-Engineer Hansen. The latter is important because the De Laval Separator Company, of New York, have just produced similar device of larger capacity for cleaning both fuel-oil and lubricating oil, and the same are electrically driven. We can forcast a great future for the American machine. It takes up very little room, and will handle large quantities of oil.

The other fitting was a combined mileage-indicator and speed recorder, a very fine piece of mechanism manufactured by the Svenska Aktiebolagel Logs. of Stockholm. It registers in knots and kilometers, both the mileage and speed being simultaneously recorded. It is the most excellent instrument of its kind we yet have seen and we without hesitation recommend some American instrument concern to endeavor to obtain a manufacturing license. If it is made in the U.S.A., we feel confident that every ship—steam or otherwise—will be equipped with one, as its value is considerable to the engineers. Hitherto it has only been used in submarines. We wonder what enterprising firm will seize this splendid opportunity!

Most motorships we have visited—and we have been aboard dozens—have been equipped with Chadburn's (England) engine-room telegraphs; but the "Bullaren" was equipped with telegraphs made by Donkin & Co., of Newcastle-on-Tyne, England.

Here is another valuable field that American manufacturers do not seem to consider important, namely, ship's telegraphs for domestic and foreign motorships; and until very recently our advertising columns have been perfectly free from such announcements. To this fertile but unexplored market we feel we must call the attention of such domestic telegraph manufacturers, as Cory & Son.

Pressure-gauges, too, are another profitable field open to domestic makers. On the "Bullaren" the pressure-gauges were made by the Nordiska Armatur Aktiebolaget of Stockholm, Sweden, and there were dozens in the engine-room. The large screw-cutting lathe and a drilling machine were made by the Lidkopings Mek Verkstad. Every motorship carries a lathe and a drilling machine. So, makers of such tools should keep their name and trade-marks constantly before the eyes of shipowners and shipbuilders, and they would secure business they otherwise might miss.

We have made special mention of these various auxiliary equipments because we realize how important it is that America shall build up a large foreign business; also to indicate the value of our own pages for this purpose and for the purpose of securing extensive domestic business in the motorshipping field. Very shortly America will be building large numbers of these fine motorships in addition to those already on order.

When Coal-Oil Johnny Goes to Sea

MOTORSHIPS—A NEW ERA IN SHIPPING

By EDWARD N. HURLEY, Chairman, United States Shipping Board

[From the "Saturday Evening Post" of December 14, 1918]
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[We congratulate Mr. Hurley for having so clearly given the official view of the important motorship question and its relation to America's merchant marine.—Editor.]

* * * * To-day we are about to see another revolutionary advance in merchant ships, and the United States will again have some advantage—if we back natural resources with national ingenuity.

Petroleum is the coming factor in shipping. It will be used under boilers to raise steam. Better yet, it will propel internal-combustion engines of the Diesel type—the motorship. We have an advantage in our large output of petroleum—sixty-five per cent of the world's output. And we are handiest to Mexico's supplies, now nearly eight per cent of the world's production, with remarkable possibilities for increase, and two types of crude oil that are peculiarly suited to marine use. * * * *

With petroleum, the motorship, and American inventive genius and energy, we have reasonable prospects of again carrying our own exports and imports on this Germanic basis of fifty-fifty; but we must not rely upon natural advantages. Coal-Oil Johnny will not do the work alone; we must put brains into the job—brains to the utmost.

Petroleum is about to effect a transformation in world shipping much more remarkable than that which was wrought by steam. The possibilities are fascinating. Both the oil-burning and the motorship remove handicaps under which the merchant navies of the world have been steadily degenerating. They reduce operating costs, increase range and flexibility, overcome certain international political handicaps in shipping, and improve the living standards and morale of those who go down to the sea in ships.

Land transportation—in practically all countries has been developed to a point where competition is regarded as wasteful. * * * * On the ocean, however, the nations have let competition run pretty much unchecked. After building their merchant fleets it might have been wise to work out some plan of international regulation. But, instead, they have fought each other on lines reminding one of our old railroad rate wars. They have used railroads, port privileges, bunkering stations and other auxiliaries to give their own ships the best of it and let the other fellow's ships have the worst.

They have done little to overcome by teamwork the violent fluctuations in ocean tonnage, rates and profits. They have fought each other on a rate basis with very little fundamental knowledge of shipping costs. And the general result has been to make shipping a risky business for the investor and a thankless job for the seaman, and to run the world into a great crisis, with a shipping plant that proved inadequate and antiquated.

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Mr. Edward N. Hurley

But the world has undoubtedly learned its lesson during the past four years. Peace will find it building bigger merchant fleets on modern lines. Petroleum will give new mechanical advantages and help to bring order into ocean transportation. If international wisdom can be applied to operation and wasteful competition eliminated, shipping may enter a new renaissance.

When Coal-Oil Johnny steps aboard a merchant ship and takes charge of the engine-room the transformation is great. The comparatively few shipping managers who have operated with petroleum will tell you that it is like switching from the One-Hoss Shay to a high-powered racing car. * * * *

ADVANTAGES OF OIL

Next comes reduction in bunker space, with an increase in cargo space. A ton of oil takes five cubic feet less space than a ton of coal, and gives eighty per cent steaming efficiency against sixty-five per cent for coal. This works out to about forty per cent saving in bunker space, which is made available for cargo in a freighter. Moreover, there is a saving in quarters for the crew, because an oil-burner ship carries fewer men. [This refers to steamships.—Ed.]

* * * * There are other advantages: Oil is often cheaper than coal in actual dollars—prices vary widely, of course. Oil does not deteriorate in storage like coal. Oil eliminates the fire risk from spontaneous combustion in coal, and is not subject to the danger of shifting in rough weather at sea. Oil eliminates ashes and ash conveyors, smoke and soot, and the necessity for frequently painting a ship. Oil reduces the expense of grate repairs, corrosion of boiler plates, fuel handling devices afloat and ashore.

Even more remarkable, however, is the increase in radius of ship operation and the possibility for planning profitable voyages without handicaps imposed by coaling. The coal-burning ship must stop frequently for fuel. Her nationality may put her at a disadvantage where foreign bunkering stations are used. At the best, coal-bunkering stations in other countries have always involved political complications. Even with the magnificent bunkering facilities afforded British ships, there are various parts of the world where the coal burner must steam a considerable distance, with little or no cargo, simply to take on coal—a well-recognized operating handicap. * * * *

But even that is only half his potential efficiency. Look a little farther ahead and design your ship to run with internal-combustion engines of the Diesel type, and he can double the efficiency.

The motorship will operate on about half as much oil as the oil-burning steamer. Its engine-room force is reduced still more—from one to three men are sufficient; and there are no stokers, for the motorship's mechanical staff is made up of skilled men. A Danish motor-liner, the "Fionia," recently went clear round the globe, making a voyage of thirty-two thousand miles, with only one engineer. [Diesel motorships only use one-fourth as much oil as oil-fired steamers, and one-fourth to one-fifth the weight of fuel used by a coal-burning steamer of similar dimensions and speed. We illustrate the "Fiona."—Editor]

The largest motorship yet built, the "Glenapp," recently made her trial trip in Scotland. She is ten-thousand tons dead weight, with two sets of Diesel engines, sixty-six hundred horse power. It is estimated she can make from twelve to fourteen knots and run from London to Australia and back more than halfway without replenishing fuel—that is, going by way of the Suez Canal, she could take oil in the Perisian Gulf and run back there without replenishing; while by the Panama route she would take oil in the Mexican Gulf.

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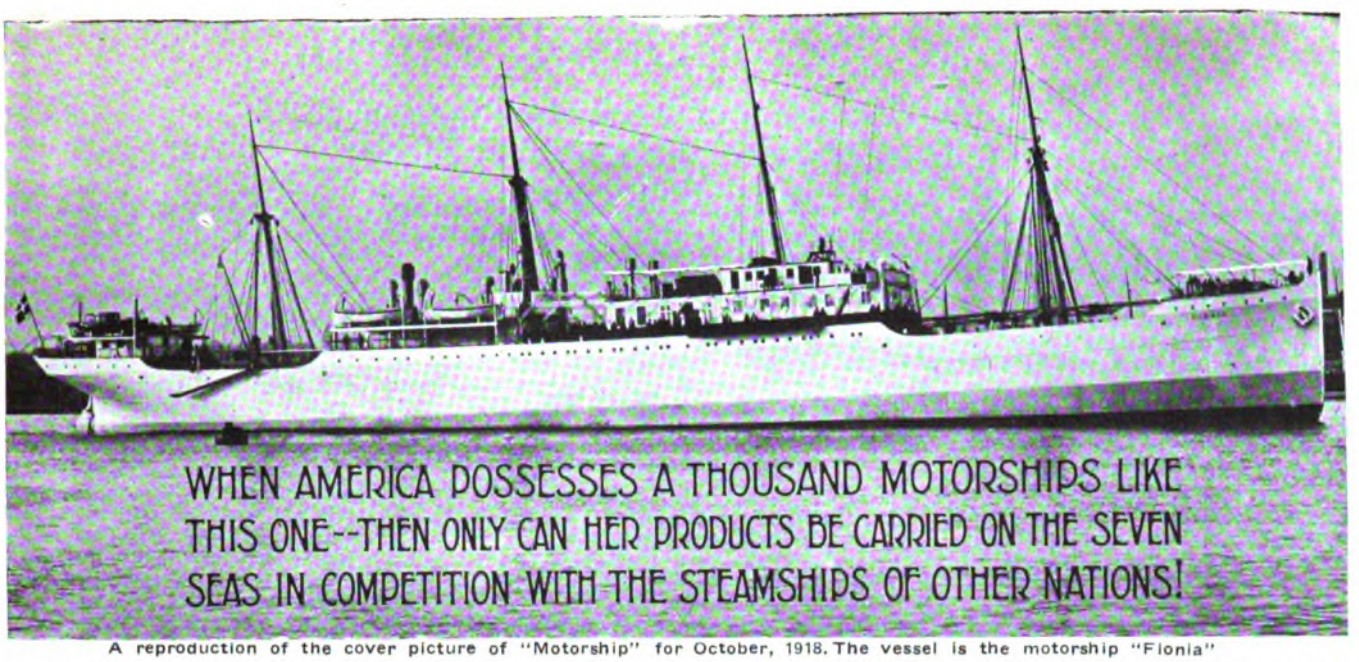
WHEN AMERICA POSSESSES A THOUSAND MOTORSHIPS LIKE
THIS ONE--THEN ONLY CAN HER PRODUCTS BE CARRIED ON THE SEVEN
SEAS IN COMPETITION WITH THE STEAMSHIPS OF OTHER NATIONS!

A reproduction of the cover picture of "Motorship" for October, 1918. The vessel is the motorship "Fionia"

This means that, with the world's merchant fleets equipped entirely as motorships, from eighty to ninety per cent of the bunkering stations round the globe could be abolished; ships would require fuel only about twice in going round the world—or at an average of every six weeks. There need be no isolated fuel stations; oil would be taken on only where ships called for cargo or passengers. [One hundred to one hundred and twenty days at full speed is the usual cruising radius of a motorship.—Editor.]

THE ECONOMY OF OIL

Anyone who has made a voyage through the tropics will find it interesting to contrast this sort of ship with his recollections of coaling incidents. If his voyage was through the Suez Canal to Australia or India, for instance, he remembers the terrific heat and how only Chinese coolies can stand the temperature of the fire hold; and how the ship was coaled at Port Said by hundreds of women carrying baskets of fuel. Neither the motorship nor the oil-burning steamer requires coaling. The engine-room of a motorship need be little warmer than the deck in the tropics; and, besides, there is probably only one man attending the engines, and he is not performing hard manual labor nor is he in dirty surroundings. * * * *

In normal times oil-fuel for such a voyage might be either a little cheaper or a little dearer than coal. Suppose coal and oil cost the same. There will be a saving of three hundred dollars in firemen's wages for the oil burner and seven hundred dead-weight tons of bunker space for carrying cargo; which figures, at five dollars a ton, earn $3,500 on the voyage. So the oil burner yields $3,800 more to her owners and a saving of three days in time. On a year's operation the oil burner would probably make at least two voyages more than the coal burner, and these would be clear profit, except for fuel cost and port charges.

Two ships of the same tonnage went round the world, leaving Europe, rounding Cape Horn, touching at San Francisco, thence crossing the Pacific and going through the Suez Canal. One was a coal-burning steamer and the other a motorship. The steamer stopped for coal fourteen times and burnt 8,500 tons on the voyage. The motorship burned 1,446 tons of oil and had capacity for carrying 1,250 tons; so she might have gone nearly the whole voyage, starting with full tanks—actually she left Europe with 820 tons, and bunkered twice—in San Francisco and the Persian Gulf—but turned an honest penny by using some of the tank capacity to carry an oil cargo from one port to another.

The steamer made the voyage in 300 days; the motorship in 236 days. The steamer carried 7,500 tons of cargo; the motorship 8,500 tons. The cost of coal—normal times—was $41,275, and the cost of oil for the motorship was $12,940—a saving of nearly seventy per cent. The coal burner carried fourteen stokers; the motorship none. The motorship carried an engine-room force of thirteen men as against nineteen for the coal burner. So there was a saving in fuel amounting to seventy per cent, a saving in time of more than twenty per cent, and in increase in cargo of nearly fifteen per cent.

These figures become most significant when reduced to terms of early operating costs. Suppose each ship cost one million dollars. The motorship saved $28,335 on fuel alone in eight months. That amounts to about four per cent annual interest on the entire investment in the ship.

And this is only a comparison of dollars on a coal-burning ship and a motorship running on an old-fashioned coal burner's schedule. The coal burner spent 183 days at sea and 117 days in port. The motorship spent 140 days at sea and 96 days in port. Because the world's cargo business is still organized on wasteful lines, with slow turn-round in port, the motorship dawdled away more than three months in port; whereas, with cargo facilities organized on a motorship basis, her greater radius and flexibility in operation would have made it possible to save much of this time. If the maritime world can tackle this one item of waste after the war it may go far toward paying off the world's war debt.

And the cost sheets do not show that other great item of betterment—morale in the ship's crew.

THE MORALE OF SAILORS

The world's shipping before the war had got into such desperate straits in morale that the men who go down to the sea in ships were seldom able to marry and maintain families. * * * *

With the motorship we can have an entirely new era in ocean transportation. It calls for skill and effects economies that will yield good wages; and its flexibility and speed should facilitate rearrangement of the world's shipping routes, so the seaman may get home more frequently and have a home worth getting to.

The motorship is here. But it still needs development and application. Thus far it has been built chiefly in small-tonnage freighters running at moderate speed. These have been highly successful economically; but there are still certain shortcomings in machinery and organization to be dealt with.

The Diesel engine must be freed of some defects that have appeared under the stress of ocean voyages, and must also be built in larger units to furnish greater horse power for bigger ships running at higher speed. The problems are now entirely questions of engineering, and American ingenuity should prove adequate to develop the fast motor-liner for passenger traffic. This type of engine was invented by Dr. Rudolf Diesel, a Bavarian engineer. * * * *

* * * * The Scandinavians have made the greatest progress in motorships, and the most successful Diesel engines on the ocean to-day are built by the Danes, Swedes and Hollanders, or under their patents. We have built some motorships, as have the British also. But certain difficulties, to be overcome by wider experience in designing the engines and operating the ships, have retarded the development of this type. *However, there are now prospects of active development for the motorship in both this country* and Great Britain.

The British, especially, are very much interested in this new type of ocean ship, and their splendid technical achievements in naval vessels during the war have given them new methods and a splendid new shipbuilding industry, which will be of great benefit in restoring the British merchant marine as soon as peace returns.

And that is as it should be and what every broad-minded American will rejoice to see; for the British merchant marine, no less than the British Navy, has played a leading part in keeping the world free. * * * *

STANDARDIZED BRITISH MOTORSHIPS

From now onward the standardized 8,200 tons d.w.c. cargo motorships building at Harland and Wolff's Govan shipyard will be completed in five to five-and-a-half months each, and the seventh of these vessels was launched on November 22nd. This was the "War Cowslip," the machinery for which was constructed at the Diesel Engine Works of Harland & Wolff's at Glasgow, where the two 3,300 I.H.P. Diesel engines of the motorship "Glenapp" were built. The first six ships of this series were tankers and took seven months from the laying of the keel to delivery. The length of the new cargo ships are 400 ft. by 52 feet breadth of beam. Under the able supervision of Lord Pirrie,—a steadfast believer in motorships—doubtless great progress will be made. Vickers Ltd. of Barrow have taken up the construction of merchant ships, and two orders have been placed with them by the Cunard Company. It is reported that these are to be motorships and in this connection it will be recalled that Sir Thos. Royden of the Cunard Line already owns a large Vicker-Diesel engines motorship, namely: the "Santa-Margharita."

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The "Semi-Diesel" Engine

A Discussion of the Surface-Ignition Type of Internal-Combusion Motor

FOR some strange reason discussions on the development, design, construction and operation of marine heavy-oil engines in America have been singularly few during the last few years. Perhaps many engineers have considered that war-work has made them too busy to devote the time to preparing and reading "papers" on the subject before engineering societies. No view could be more mistaken because such "papers" and the discussions that follow always are of interest, and sometimes of the greatest value to all concerned; and during war development of motive power—particularly for naval and mercantile ships—is highly important. During the recent meeting of the American Society of Naval Architects, at Philadelphia, not a solitary "paper" was read on marine internal-combustion motors, yet the success of America's future mercantile marine is wrapped up in the heavy-oil engine. It becomes obvious that a special marine and stationary oil-engine association is badly needed, where all the problems can be regularly discussed.

In Gt. Britain there is an association for that purpose, before which some most useful lectures have been given during the war with beneficial results. Also the various British marine engineering societies have devoted far more attention to the internal-combustion engine than have similar American associations, and even have awarded scholarships and gold medals to the best works on the subject. In fact a "paper" on this subject was given the highest award for the year out of all papers read before the North East Coast Institute of Engineers and Shipbuilders. Encouragement of similar nature could well be made by our own associations.

At a meeting of the DIESEL ENGINE USERS ASSOCIATION (England), on 24th October, 1918, MR. JAMES RICHARDSON, of Messrs. William Beardmore & Co., Ltd., Dalmuir, Scotland, read a paper on "The Semi-Diesel Oil Engine,' which he defined as an internal-combustion engine using oil-fuel, but having an uncooled portion of the combustion chamber at high temperature to help in the vaporization and ignition of the injected fuel. He excluded from this definition certain oil-engines which, although not called Diesel engines, yet approximated to this type, relying on the heat of compression for ignition.

It is necessary at this juncture to point out that in calling this class of engine "the Semi-Diesel," Mr. Richardson contradicts his own definition of its cycle of operations. He excludes from this definition the very engines that he could be excused for calling "Semi-Diesel," namely the Brons and Hvid, Burnoil-Hvid, etc. The most appropriate name—for the want of a better one—for hot-bulb, hot-plate, hot-disc., hot-tube, and hot-piston, motors is, "surface-ignition oil-engines," as this term includes them all, but clearly distinguishes between the Diesel and the "Semi-Diesel" types. For a considerable time "Motorship" has avoided the general use of the term "Semi-Diesel," and has adopted "surface-ignition" as a standard name.

The chief claim of the Semi-Diesel engine, said Mr. Richardson, was its simplicity, and it was for this reason that the majority of engines of this type were made on the 2-stroke principle and were confined to comparatively low powers per cylinder. [125 b.h.p. per cylinder is the highest yet developed in actual ship propulsion—*Editor*].

Air injection of the fuel had been used in earlier types of engines, but as this had led to extra complications in the way of compressors, etc., the modern type of engine worked on the "solid" injection principle in combination with the hot-bulb for vaporizing and igniting the fuel. Air compressors were now sometimes used on Semi-Diesel engines, but more for taking the place of the water-drip in cooling the combustion chamber than for the injection of the fuel.

In the matter of compression the advantage of high compression, which according to theory resulted in economy in fuel and a higher mean-effective-pressure per cylinder, was counterbalanced by an advantage of low compression in the more oven turning moment and a higher mechanical efficiency.

The Semi-Diesel was a variable compression engine, high compression being limited to that at which the compression alone ignited the charge, and the lower to that at which the size of the hot-bulb became inconveniently large. Although high compression was theoretically advantageous, from practical considerations there was a point above which it was inadvisable to go due to losses incurred by piston friction. The higher the compression the greater the loss due to this source, a larger number of rings being required. On this account the mechanical efficiency of the internal-combustion engine was low compared with that of the steam engine.

As regards fuel economy the Semi-Diesel engine gave very satisfactory results, as its cycle of operation was nearer the economical explosion cycle than that of the Diesel engine.

In the matter of flexibility the Semi-Diesel engine was really a constant load and constant speed engine. Flexibility could be considered under three headings:

(1) Constant M.E.P. with varying power and revolutions.
(2) Constant speed and varying M.E.P.
(3) Varying speed and M.E.P.

Condition (1) need not be considered from a practical point of view.

After considering the second condition in detail, Mr. Richardson pointed out that even where means were provided for throttling the cooling water and scavenging air, a point was quickly reached where the heat of the bulb was insufficient to ignite the charge, and the engine consequently "missed."

The water drip was used in order to extend the range of working from overload to a small load without recourse to the blow lamp. At full load the water served to take heat from the bulb so that a low-compression engine with a fairly large bulb could run from ¾ to full load satisfactorily. By cutting off the water, low load could be reached. The water for this purpose should be as pure as possible to prevent deposits. It had a deletorious effect on the lubrication of the internal parts and was only a crude solution of the problem.

The better solution was to vary the point of ignition of the fuel charge to correspond with the load on the engine. Gears had been designed by means of which, in conjunction with the governor, the ignition might be varied according to the amount of fuel admitted to the engine.

In the matter of scavenging the efficiency was lower in the 2-cycle engine than in the 4-cycle, for which reason the 2-cycle engine had not achieved the success which had been predicted for it, as the amount of air available per cylinder was limited to the volume swept by the piston. In addition to this the air drawn into the crank-chamber was impregnated with lubricating-oil and had a cooling effect on the working parts. The scavenging efficiency consisted of the efficiency of the pump and the efficiency of the scavenging of the cylinder, and was affected by losses due to the pump. Probably the greatest loss in efficiency concerned the scavenging in the cylinder. The size and shape of scavenging, exhaust passages, and ports, had a great effect on the efficiency, and large exhaust ports, ample passages, and a minimum of restriction in the exhaust ports were a necessity.

The subject of stroke-to-bore ratio was intimately associated with this question, and Mr. Richardson's experience suggested that the larger the stroke to bore ratio, within limits, the less the escape of scavenging-air through the exhaust.

The question of injection depended primarily on several factors of which turbulance, point of cycle at which injection occurred, fineness of spray and distance of injector from hot igniting surface, might be mentioned. Turbulence was on a par with the question of scavenging and had as yet received little attention. With regard to the period of injection, practical considerations determined the period for full power running to be about 30 degrees. No standard had been fixed for fineness of spray, although this could be too fine. It was essential that the whole of the oil should be in the combustion-chamber in the form of a spray before the first particle touched the hot-bulb, which argued for a long throw of the fuel, although this militated against flexibility.

In the matter of fuel it was only a few years since that the majority of Semi-Diesel engines required paraffin or the very lightest type of fuel-oil, and the great outstanding difference between the Diesel and the Semi-Diesel had been the small rang of fuels with which the latter could cope. Recently producers had been led to experiment in the use of heavier fuel-oils more readily obtainable.

At present the engine could use most fuel oils ranging between 0.8 and 0.9 in specific gravity. Shale-oil had been most frequently used. Heavy oils required pre-heating to facilitate pumping. In this connection it should be noted that the Semi-Diesel, being of the "solid injection" type, did not run with as clean an exhaust as the Diesel, and on this account the amount of overhauling of parts required was greater.

As regards lubrication this was carried out in almost a similar manner to the Diesel engine, the consumption working out at about 0.02 lbs. per B.H.P.

The starting of the engine was carried out by means of compressed air, a compression of from 80 to 100 lbs. per square inch being necessary. The bulb, prior to starting, was made sufficiently hot to ignite the fuel, one impulse being usually enough to start the engine.

The reliability of the Semi-Diesel engine was of a high order, especially in the modern types with ample bearing surfaces and carefully designed means for the provision of the necessarily restricted quantity of lubricating-oil.

In conclusion Mr. Richardson referred to the recent extension of the field of application of this engine and to the increase in the size of engine and power developed; he foreshadowed great developments in the near future. It might be expected that the lines of development of the Semi-Diesel and the Diesel engines would become more closely merged.

Practical difficulties appeared to confine the Semi-Diesel engine to the 2-stroke principle, and improvements in the scavenging efficiency might be expected.

The question of "solid injection" became a simpler issue when associated with surface ignition. All considerations in the design of the fuel-pump gear and the injection had been subordinated to simplicity, but with the increasing demand for the same degree of flexibility and a capacity to burn as wide a range of fuels as the Diesel, considerable improvements might be expected.

Motor Fishing Boats on the Mississippi

THE impetus that the internal combustion engine has given commercial fishing on inland rivers can scarcely be overestimated. It is of particular importance just now since the demand for fish has so greatly increased in our effort to conserve meat. The Mississippi river, one of the greatest fish-producing bodies of water in the world, is a striking example of the wonderful boost liquid-fuel power has been to the fish industry.

Nearly 10,000 men are engaged in fishing and clamming on the Mississippi. In the old days they used row boats exclusively. Fishing grounds were usually several miles away from their homes and it required the best part of the day to get to and from the fishing grounds. There was the laborious effort of plying the oars for long hours also. It is little wonder that the fishermen eked out so small an existence under such conditions that only a very inferior class of men were in the business.

The marine motor has revolutionized the order of affairs. There is money in the fish business now and also the market is supplied with several hundrefold as many fish from the Mississippi as formerly. Practically every fishing boat on the river has its little three or five horsepower engines and most of the fishermen have beside power launches. They start out in the morning with a launch and several boats usually in tow and in a very short time are in the sloughs and lakes setting their nets and lines. Having made their haul they are back at camp in a short time getting the fish ready for sale while they are very fresh.

Aside from the basses, pickerel, pike, sunfish, croppies and catfish, which are recognized everywhere as the best food and game fishes in the world, the Mississippi holds in its waters enormous quantities of buffalo, sturgeon, suckers, carp, sheep-head and dog-fish. These are now all marketable fish and by far the largest per cent of fish marketed are of this class. The yearly catch reaches many million pounds. Most of it is shipped to eastern markets. New York City is the largest buyer. One single haul off the shores of Iowa recently netted fishermen who landed it $2,000.00. A fish dealer who buys over a stretch of twenty five miles of the river estimates that a mile of the river yields about $3,000.00 a year. The fishermen say there is no falling off of the number of fish in the river and that with proper management the output can be increased. The use of the gasoline engine and the dollars it is putting in the business is attracting a better class of men to the profession and the present prospects are that the industry will grow in importance.

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New Type of Fishing Auxiliary-Schooner for the East Coast

Sails to Be Auxiliary to the Heavy-Oil Engine Power

By GEORGE STORY HUDSON

A TYPE of auxiliary schooner new to New England, though familiar on the Pacific coast, is about ready for launching at Ellsworth, Me., for McCoy Brothers of Miami, Fla. This vessel will have sails as auxiliary to a crude-oil motor of 125 h.p., reversing the practice that has obtained on that section of the Atlantic coast ever since internal-combustion-engines became indispensable.

The new vessel is designed to carry passengers and freight between Miami and Nassau and embodies all modern conveniences, it being the desire of the owners to introduce a craft of pleasing model and reliable power plant that should be as continuous in operation as steam and as dependable in actual use. Knowledge that the motor vessels in coastwise trade on the Pacific have been consistent winners of dividends where cargoes offered in suitable volume, was the deciding factor with the Miami concern.

Till now auxilary schooners constructed in New England were, in reality, schooners with only enough power to "help them along" in moderate weather or provide means of shifting from berths. This applies particularly to the larger schooners built for the fishing industry out of Boston and Gloucester; in fact, auxilary schooners in the East are largely engaged in fishing and, the bigger the vessel, the longer trips she makes to the banks off Nova Scotia and Newfoundland.

Maritime circles await with lively interest performance of the McCoy vessel which may have her official trials over the government course at Rockland, Me. Should she develop the promised eight nautical-miles an hour, and if endurance tests prove the motor capable of continued work without developing bearing troubles, there is no doubt that more schooners of the same general characteristics will follow.

Just now beam trawlers are in the ascendancy as a business proposition and a large proportion of them are provided with steam installations. If the McCoy type can compete with the more costly steamer engaged in dragging the ocean bottom in quest of food why, then, the idea will be adopted more generally.

Never was the fishing industry in a more unsettled state as regards the most suitable craft to be employed. There is not much doubt that the conventional sailing schooner is out-classed. The auxiliaries quickly demonstrated their worth, years ago, by making quick trips and crews gradually forsook the plain sail craft till auxiliaries could have the pick of men for the asking. No fisher boat can be successful without an expert crew; therefore owners realized that their obsolete tonnage was doomed unless motors were installed to keep pace with the times.

Now, the trawlers fitted with moderately powerful engines, are landing heavy fares and crews are paid unheard-of wages. The modern vessel is distancing the older one just as the auxiliary became popular not so very many years ago. The trawler that operates a drag instead of gangs of hooks and performs hard work mechanically is in such good favor that even best among the auxiliaries find it hard to keep skilled dorymen and the skippers who rank among killers and highliners are gradually going into the otter trawl game. Between now and next June fully 20 of these beam trawlers averaging 150 feet in length will run out of Boston, Gloucester and Portland and their advent dismays men who declared that beam trawlers could never make a living on this side of the Atlantic.

Perhaps the nearest approach to the McCoy vessel was the Boston schooner "Victor & Ethan," built at Essex, Mass., a dozen years ago, and sent to the Pacific to engage in the halibut fishery. This schooner was a typical vessel about 100 feet long, well designed and put together and her owners decided that more profit could be had in the new venture particularly as the local industry was, so to speak, overcrowded. She was equipped with a heavy-duty gasoline motor weighing upwards of five tons and developing somewhere near 110 h.p., making the passage via Magellan Straits in ordinary trim as to spars and rig in charge of Capt. Robert Lathagee of Boston, being joined at destination by another captain and crew of New England fishermen.

It did not take long to learn that the "Victor & Ethan" had to depend principally on the motor in making long runs to the Pacific grounds and, unless breezes were fair, the lofty masts and rigging offered resistance that slowed down speed annoyingly. After a few months the "Victor & Ethan's" owner decided to cut 20 feet off the masts and shorten the rig generally. This was done and the vessel benefitted, it is said, making quicker trips and not so hard on herself in rough weather.

After a time the "Victor & Ethan" returned to Boston via the Panama Canal and immediately engaged in fishing out of Boston, visiting, for the most part Georges, Banquero and other profitable grounds off Nova Scotia. She remained under the short rig which was not copied locally, so far as I am aware, and the motor which drove her about eight knots, was relied on continuously, although being helped by canvas with leading winds as opportunity offered.

This schooner after being looked upon with more or less favor by New Englanders, was sunk in collision a few months ago. The McCoys, as I have said, advocated a schooner with short rig and powerful motor and their ideal found expression in the hull that grew at Ellsworth. Then the fishing industry recalled that the bald-headed "Victor & Ethan" was, after all, a type destined to become popular not alone in fishing but in coasting and in the general carrying trade.

Capt. W. F. McCoy, who superintended construction of the new vessel, attributes failure of some auxiliaries to the fact they were designed, first, to depend on wind for propulsion and the motor could be no larger than the space that could grudgingly be spared from hold or living accommodation and, as matter of fact, the power plant often was kept down for reasons of economy. The captain proposes to operate his vessel as a steamer with time runs that prove so valuable in thick weather to the navigator. He expects the 50-inch propellor will turn about 200 revolutions per minute, and with r. p. m. as basis for calculation concludes he will be able to go and come in all weathers where it would be wise to operate a 110-footer.

A feature of the McCoy schooner is the tank system with capacity of 2000 gallons of crude oil giving radius of about 1800 miles. This ample fuel reserve will permit the schooner to make several round trips on her route without necessity for bunkering. The usual auxiliaries are to be installed and the accommodations for passengers will be thoroughly ventilated by fans. In actual service the vessel will compete for business with steam-engined craft in a section much favored by tourists.

The Polar-Diesel driven motor whaler "St. Ebba"

BRITISH DIESEL ENGINE BUILDING

(From the Liverpool (England) Journal of Commerce, Nov. 7, 1918.)

With peace near at hand British engineers are beginning again to give thought to the problem of the high-powered internal-combustion engine for marine propulsion, and of late we have had good evidence that certain of our leading concerns will seriously take up Diesel engine construction, not only building under Continental license, but the turning out of sets to their own design. As an example of this, it may be mentioned that Sir W. G. Armstrong, Whitworth and Co., Ltd., of Newcastle-on-Tyne, who some years ago acquired a license for the M. A. N. Diesel, a (German) two-cycle installation, have decided to build a four-cycle engine of their own design. Already the first set has been completed, and is said to have successfully passed through continuous shop trials. It is understood that this new engine will be built in powers suitable for the medium-sized ocean going cargo carrier, and that there is a likelihood of motor ships being laid down shortly in which it will be installed as full power propelling machinery.

The step which has been taken by Sir W. G. Armstrong, Whitworth and Co.. is, indeed, a wise one, particularly in favoring the four-cycle type. No doubt great development has taken place on the Continent in the building of the two-cycle engine, particularly in Italy, where at the moment there are over 50 motorships taking shape of 8,000 tons d.w. capacity each, all to be given twin-screw machinery working on the two-cycle prinicple, but nevertheless the fact remains that much more experience has been gained with four-cycle engines. The four-cycle type is decidedly more popular with shipowners, and, furthermore, a type which has given uncontestable proof of reliability on hard continuous sea service. Where very high powers are concerned, there is much to be said for the two-cycle installation, and many hold the opinion that for the larger class of ocean going liner it will ultimately command the field. The future, however, will decide. We certainly are on the eve of witnessing during the next two or three years no small competition between the two distinctive types of high-compression internal combustion machinery. [We understand that Sir W. G. Armstrong, Whitworth & Co., will continue with the development of the two-cycle engine in high powers, as well as build their new four-cycle engine.—Editor.]

ANOTHER CONCRETE MOTORSHIP

Apparently, British oil-engine manufacturers are already after foreign trade, whereas American motors have been held up by our own authorities awaiting export license. A British surface-ignition oil-engine of 20 b.h.p. has been installed in the concrete barge "Concreto Primero," built by Hume Bros. at Rio Santiago, Riachuelo, Argentine. This craft is 80 ft. long by 20 breadth.

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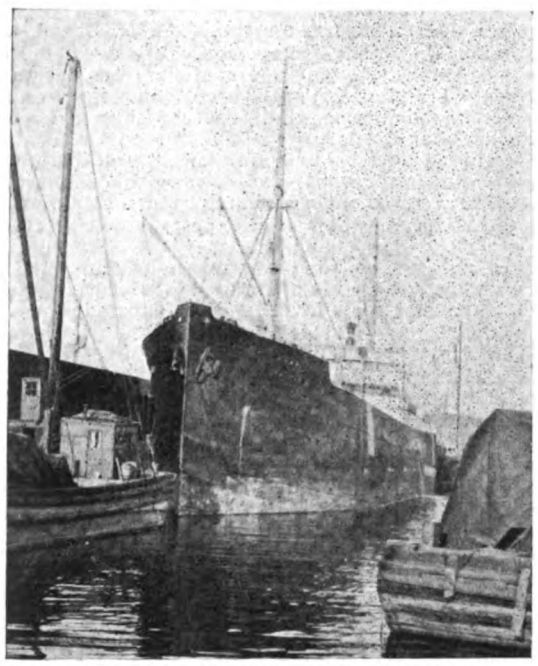
Splendid Record of Another Veteran Motorship

Danish Merchant-Vessel "California" Travels 180,144 Nautical Miles, at an Average Speed of 9.73 Knots on a Total Sea-Consumption of About 8,300 Tons of Oil-Fuel—Her Performances Include Non-Stop Run of 27 Days at 9.54 Knots; Also a 5,812 Miles Voyage at 11.38 Knots Average Speed. An Economy of Approximately $3,000,000 Effected.



The motorship "California" at Pier 36 Brooklyn, New York

IT IS hardly reasonable to expect that motorships built in the earliest days of the high-powered marine Diesel-engine should now be giving as reliable service as steam-engined vessels which class of engineering has been developing for a century. Yet there are many Diesel-driven freighters and tankers placed in service before the war, and which really are experimental craft, that are regularly making performances better than the average modern tramp steamship, as for instance, the heavy-oil engined motor tanker "Vulcanus." This vessel, although the first full-powered Diesel-driven ocean-going ship placed in service, to-day is operating with clock-work regularity, doing credit to her builders, and substantiating the judgment and foresight of her owners. Some early vessels naturally have given considerable trouble; but this was chiefly due to the lack of experience of the designers, builders, and owners, and not to the Diesel principle. Confirmation of this is found in the diversity of designs, all of which hardly can be correct. They were experiments, and, all experiments do not result in success, so let us discriminate!

Another splendid showing is to be found in the operation of the motorship "California," which visited New York towards the end of November last. Alongside of her were the big motorships, "Chile" and "Peru," while the large tanker m.s. "Hamlet" also was in harbor awaiting license to sail to Sweden, and there also had just arrived the largest merchant ship ever built in Sweden, namely, the motorship "Bullaren" a new vessel of 9,500 tons. Other big Diesel-ships in harbor included the "Siam," constituting quite a little fleet of foreign motorships. It caused us to ponder if America was really awake. Through the courtesy of her Chief-Engineer, Mr. C. V. Hendricksen, we were enabled to take the following record of her voyages from the log-book and the results probably will surprise many shipowners, as few tramp steamers of her designed speed and power can make such a splendid showing of consistent speed.

Voyages of motorship "California" from Sept. 30, 1913 to Nov. 24, 1918.

(Ship fully-loaded practically all the time.)

Voyage Number	Distance in Nautical-miles	No. of Hours	Average Speed in Knots
1st	8,054	809	9.95
2nd	4,743	568	8.35
3rd	4,147	408	10.16
4th	4,874	545	8.94
5th	3,999	379	10.55
6th	4,951	498½	9.99
7th	4,444	421¼	10.64
8th	4,605	498½	9.24
9th	4,701	486¾	9.63
10th	4,570	570	8.01
11th	4,462	459¾	9.70
12th	4,653	479	9.86
13th	4,366	417¼	10.51
14th	5,812	510¼	11.38
15th	4,991	500	9.98
16th	4,461	462	9.65
17th	4,761	492	9.77
*18th	3,925	357¼	10.98
19th	5,336	521¼	10.23
20th	4,019	387¼	10.37
21st	4,086	460½	8.87
22nd	4,202	461¾	9.10
§23rd	4,020	433	9.28
24th	4,237	498½	8.53
25th	4,404	448¼	9.82
26th	4,583	432¾	10.59
27th	8,331	805¼	10.41
28th	13,857	1402½	9.88
29th	12,295	1291	9.52
30th	11,989	1207¾	9.92
31st	12,266	1285¼	9.54
Total	180,144 mi.	18,496½ hrs.	9.73 knts.

* Half-loaded.
§ Bad fuel-oil (Dirty and too much sulphur).

Belonging to a neutral country, it will be understood that, during the last four years she has been subject to various delays in port awaiting permission to sail, etc., otherwise she even would have covered a greater distance. Naturally a ship's speed varies a little, this to an extent depending upon the state of her bottom and the periods between scraping. The "California" has been engaged for a considerable time in the South American and South Pacific where her underbody naturally gets dirtier more quickly than if she were in the North Transatlantic trade.

Nevertheless, shipowners will do well to compare the above results, with the records of their own steam-vessels, and we believe they will be surprised to find that the motorship has made a much better showing. If we delete the 2nd, 10th, and 24th voyages of the m.s. "California," her average sea-speed will have been about 10 knots for the five-year period. Her best voyage speed was nearly six thousand miles at 11.38 knots.

It will be noticed that on one voyage of nearly four-thousand miles (the 18th) the average-speed was almost 11 knots. She was only half-loaded, whereas, on almost all the other voyages she was full-loaded both ways. On the 23d voyage the fuel-oil obtained at Baltimore was of a dirty nature and contained at least 2% sulphur, consequently, her engines had to be stopped nearly every day and the valves changed. This is unusual, because the general rule is to only change the valves when in port after about 4,000 miles operation, the other set being ground in readiness when in port, leaving the simple operation of changing the valves to the time when the engines are idle. We believe that had she been equipped with a good separator, such as the new De Laval, little or no trouble would have resulted from the dirty oil-fuel. The m.s. "Bullaren" has one of these separators for the lubricating-oil. Had the oil used by the m.s. "California" been cleaned the sulphur should not have caused any inconvenience.

A word or two about the fuel question is not out of place at this juncture. In previous issues of "Motorship" we have pointed out the advisability of using good oil-fuel for motorships, such as clean crudes, or refined residual-oils such as solar-oil, gas-oil, navy-fueloil, etc. The fuel to be used depends largely upon the available oils, the arrangements on the ship for cleaning the fuel, and the difference in the prices. If clean oil-fuel is very expensive and difficult to obtain, then a ship owner is justified in using the heavier fuel, but he should pay the engine-room men a bonus, because the dirty fuel will give more work in the engine-room in the way of cleaning the exhaust and fuel-injection valves. Some engineers are better operators than others and can use the heavy fuel without much bother.

The fuel-consumption of a motorship is so small that the difference in cost of the dirty and clean fuels make practically no difference in the economy of the vessel, so far as comparison with a steamer is concerned. For instance, on the last voyage of the m.s. "California" she used approximately 494 tons (3,458 barrels) for the distance of 12,266 miles. Solar-oil of about 33 degrees gravity was the fuel used for which about $3.40 per barrel was paid, or a fuel-bill of $11,757.20.

Had she used Mexican crude-oil at $2.00 per barrel, she would have had a fuel bill of $6,916.00. Consequently the saving could have been only $4,841.20. Seeing that she carried 7,500 tons of cargo in addition to fuel, water and stores, the difference in cost per mile and per ton-mile practically is infinitesmal, being $0.64 per mile, or $0.005 per ton-mile.

In view of the fact that at least $50,00 per ton freight is received on the cargo, we do not think that $0.005 per cargo-ton per mile will effect the economy of the ship. This, of course, does not refer to a steamer where the difference in fuel consumption is so great; but is applicable to a motorship because of its inherent economy. At the same time the use of a good separator, costing about $1,000.00, should enable dirty oils to be used without trouble, and so approximately $5,000.00 would be saved per voyage.

Chief-Engineer Hendrickson states that given clean fuel his Diesel motors will run as regularly and as reliably as any steam-engines, and without any racing of the propeller. The governor instantly cuts off the fuel at the slightest increase of the propeller speed, and of course, there remains no power in the engines to cause them to speed-up when the propellers raise out of the water and suddenly take the load off the engine.

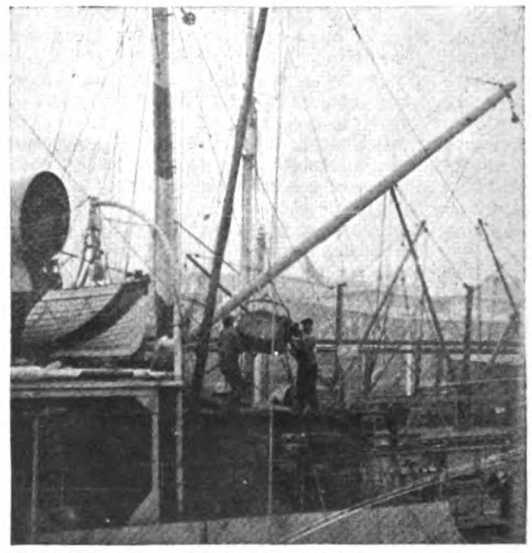
Immediately the governor cuts-off the fuel about two revolutions of the engine beyond a certain speed eliminates all the power and renders the engine virtually dead until the governor relaxes and permits the fuel to again enter the cylinders. The engine, of course, does not actually stop, as the relaxing of the governor permits the engine to pick-up again almost as soon as the speed is halted. Also the governing sometimes is gradual in action, depending upon the conditions that it is called upon to take care of.

Before the war, the "California" paid $1.40 per 40-gallon barrel for Solar-oil fuel, and $1.00 shortly after the war started. Since then the price has steadily increased and now about $3.40 is being paid. But, as previously pointed out, this does not effect her remarkable economy.

For instance on her 28th voyage she went from New York to the Brazilian coast via the Straits of Magellan, a distance of 13,857 miles. She started with 900 tons of fuel in her bunker, and 7,500 tons of cargo in her hold, and when she reached New York on her return she had several hundred tons of fuel left.

Now a steamship would have been obliged to have gone out of her course and have put in at Barbados, etc. for coaling, and would only have been able to have carried about 6,500 tons of cargo.

Thus, some of the wonderful advantages of the Diesel-engined ship at once are apparent, and it is rediculous to use the expression "unreliable" as a reason for not building motorships; because they are doing the work in a highly efficient and reliable manner, as is indicated and proven by the performance of this and other ships. And what one motorship can do, other well-built, well-designed and properly operated motorships can regularly repeat.



Bunkering a coal-burning ship by means of a tip-bucket and a wheelbarrow—an incident recently photographed in New York harbor by the Editor of "Motorship." This is a strong contrast to the simple, rapid, clean, and efficient method of bunkering an oil-fired motorship. (See page 13, Nov., 1918, issue.)

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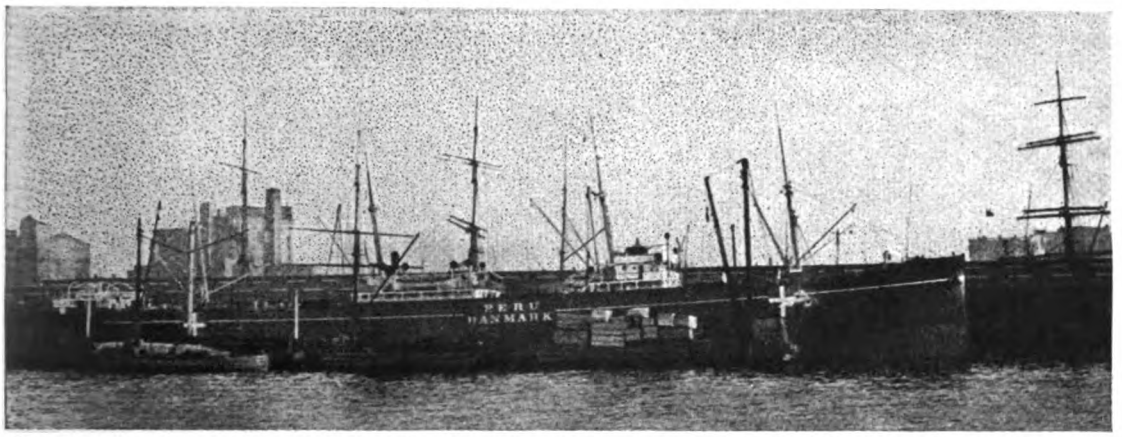

The Danish motorship "Peru" in New York harbor. She was berthed close to the motorship "California," motorship "Chile," and motorship "Bullaren"

Perhaps it will be just as well to give the dimensions of the m.s. "California" before proceeding further with this article, in order that her economy and cargo-carrying merits may better be understood. Her engines were built by Burmeister and Wain.

Loaded Displacement	12,300 tons
Dead-weight capacity	8,200 tons
Actual Cargo carried	7,500 to 8,000 tons
Weight of Ship	4,100 tons
Fuel-capacity	900 tons
Length B. P.	405 ft.
Moulded breadth	54 ft.
Moulded depth	26 ft., 11¾ in.
Mean draught with full-cargo	25 ft., 6 in.
Horse-power	2,400 IHP.
Average speed of ship for 5¼ years	9.73 knots
Number of propellers	Twin
Designed speed of ship	10¾ knots
Total number of engine-cylinders	16
Bore and stroke, 540 mm. by 731 mm. (21.259 in. x 28.750 in.)	
Designed Engine-speed	140 R. P. M.
Total fuel-consumption (at sea) in 5¼ years,	8,300 tons (about)
Make of engine	B & W Copenhagen
Builders of ship	B. & W., Copenhagen
Designers	B. & W., Copenhagen
Owners, Fornede Dampskibselskab (United Steamship Co.), Copenhagen, Denmark	

On some occasions when in ballast, she has made a speed of 12 to 12½ knots with the engines turning at 140 R. P. M. This well-known Danish firm of motorship builders have a tendency to design their Diesel engines to run at higher speed than most other makes; but, contrary to general belief, the high revolutions do not seem to effect the speed-efficiency of the ship, compared with slower speed steam-engined vessels. In fact, the five years average of 9.73 knots clearly demonstrates the accuracy of the points outlined in our article in the December, 1917, issue of "Motorship" entitled "Diesel-engine Speed and Propeller Efficiency." We recommend that every ship owner and naval-architect read this article if he already has not done so. A few back numbers still can be obtained from the publishers, price 50 cents each. Some most important matter were discussed therein.

As a further indication of what the m.s. "California" has done, we will probe into a few of the voyages. From New York to Monte Video, and return, a distance of 12,266 nautical-miles, the speed averaged 9.54 knots. Her port engine averaged 1,186 indicated horse-power and turned 9,843,200 revolutions, while the starboard engine averaged 1,214 IHP. and turned 9,922,400 revolutions. Together the engine averaged 2,400 IHP. at 128.5 R. P. M. on fuel consumption of 160 grammes (453.6 grammes=1 lb.) per IHP. The mean pressure of the engines was 6.49 kg. and the propeller slip was 14%. This was her last voyage up to the time of our visit, and it was on the way to New York that her engines ran for 27 days without stopping.

To those who doubt these figures, we may say that when we extracted them from the log, the Superintendent-Engineer of one of the largest American steamship companies was present and can vouch their accuracy. We refer to Mr. Bernard Mills of the American-Hawaiian Steamship Co. of 8-10 Bridge Street, New York, N. Y. We mention this to establish the reliability of a well-designed marine Diesel-engine and to endeavor to convince those shipowners who still think that the modern motorship is a doubtful proposition. Since the "California" was built, her builders have had much more experience, having launched over a dozen addiitonal vessels. Other motorship builders, of course, have had similar experience.

One excellent voyage worthy of particular notice was number 14, during which she covered 5,812 nautical-miles at an average speed of 11.38 knots, or over half-a-knot in excess of her designed speed. This undoubtedly was a splendid performance.

Another voyage was from Iquique, Chili, to New York, U. S. A., a distance of 8,331 miles—via the Panama Canal. She started with 8,000 tons of nitrates and 300 tons of oil-fuel and did not have to re-bunker until reaching port. Her speed averaged 10.41 knots.

There does not exist a steam-driven ship (either with gear-turbine or reciprocating engines) of the same size as the "California" that could duplicate this particular performance of the "California," or the other performances if we take into consideration the amount of cargo carried and the fuel consumption.

That is why it is essential for America to have a great fleet of such motorships if we are to have a successful mercantile marine!

The total engine-room staff of the "California" consists of 12 men as follows:—

Chief-Engineer	1
Second-Engineer	1
Third-Engineer	1
Fourth-Engineer	1
Asst.-Engineers	4
Oilers and cleaners	4
Total	12 men

One "mistake" in her design was the installation of steam winches and anchor windlass. It may not really have been a mistake at the time she was built, as electrical auxiliaries have been developed and improved since 1913. But, it is uneconomical! The oil-fired donkey-boiler is installed in the after-end of the engine-room, and the engineers like it because it keeps the engine-room warm and dry in cold weather; but, has a similar disadvantage when in equatorial regions. However, it uses 1½ tons of oil per day when in port, compared with about ¾ ton if the winches were Diesel-electric driven. Solar-oil is used as fuel for this boiler, the same as for Diesel engines. No donkey-men are carried, the Diesel engineers attending to the firing of the boiler when in port.

In addition there are 2 three-cylinder Diesel-engines of 200 bhp. each, driving the main compressors and electric generators. One of these sets are in constant use and the other set is used as a stand-by in case of a break down. Each set uses 12 kilogrammes of fuel-oil (27.6 lbs.) per hour. The steering-gear is electrically operated, so the donkey-boiler is used only when in port, and not when at sea.

Only the high-stage compressor is driven directly off the main engine, the other stages being driven by the auxiliary engine. The latter is an Atlas vertical compressor. Taken as a whole, the arrangement of auxiliary machinery could be improved in another ship from the point of view of economy, and we have seen motorships which we consider are better arranged in this respect, such as the m.s. "Chili" described and illustrated in the November, 1918, issue of "Motorship," and the m.s. "Bullaren."

For lubrication of the engine cylinders Vacuum D. T. E. oil is used, and Vacuum R. R. for the air-compressors. The R. R. oil is used for the high-stage air-compressor because it will not explode. The lubricating-oil consumption amounts to between 54 and 56 kilos per day, exact records being difficult to keep. Both Bosch and Detroit lubricators are used for oiling the cylinders of the main engines. The Bosch lubricators are excellent, said the chief-engineers, but no more could be obtained, being of German construction, so when in Baltimore, he fitted some Detroit lubricators which then were unknown to him, and these are doing the work in a very satisfactory manner indeed. This is pleasing to know, because the war has resulted in various American-made lubricators becoming tried by European-Diesel engine builders, who could not get German products and we believe that provided adequate publicity is maintained their adoption will be permanent even after the return of German-made lubricators, with their established reputation in Europe, to the market. (American manufacturers of lubricators please note.) There now is an excellent opportunity to "get in good," as witness the recent happy experiences of the Madison-Kipp Lubricator in the Norwegian market which publicity in "Motorship" opened to them. Of late, several American lubricator manufacturers seem to show singular lack of desire to thus prepare to meet coming business future competition in this particular field. Others have been more enterprising and have benefitted accordingly.

Next, we will come to the question of machinery troubles experienced with the Diesel-engines of the m.s. "California." Being an early motorship, built in the days when sea-going experiences with high-powered motors were small in quantity, it is not to be expected that she has been faultless; but the troubles have not been more than are met with in the average modern steam-driven vessel. In fact, we doubt if they have been to the extent of those experienced with many new geared-turbine cargo steamers.

We accidentally overlooked asking if any crank-shaft fractures have occurred, but there is no reason to anticipate such unless the metal was faulty. However, three cylinder-heads have cracked in five years; one after 3½ years; one some months later, and the third but a few months ago. These cracks occurred in operation and apparently were caused by tiredness or deterioration of the metal, which in turn may have been due to faulty casting or moulding, and not to design.

No pistons have cracked, and the piston-rings are only cleaned once a year. The pistons, by the way, are cooled by lubricating-oil, of which a steady stream is pumped through the piston-rod. Later pistons of this make are water-cooled, and which most operators seem to prefer. Carbon deposit scraped off the cylinder walls is very slight and later designs are so arranged as to entirely prevent this, as in the case of the m.s. "Bullaren" described elsewhere in this issue.

The owners of the m.s. "California" have a sister motorship, namely, the m.s. "Oregon," which has been accomplishing similar work. They also own the smaller motorship "Dronning Margrethe" illustrated on Page 28 of our December, 1918, issue. And, when shipbuilding conditions better themselves in Denmark they will order additional motorships. At present, it is not possible for them to obtain them as the six large Danish motorship building yards are loaded up with vessels for the East Asiatic Company, and there is a great scarcity of material

Finally, let it be pointed out that, *compared with a steamer of similar overall dimensions*, the economies effected and the extra amount of cargo carried (at least 60,000 tons), and taking repairs into consideration, the earning power of the m.s. "California" must have been not less than three-million dollars ($3,000,000) over what the steamer could have earned during the 5¼ years if she were in the same service. Any shipowner can figure this out for himself! And, a gain of three million dollars is not to be treated lightly. Yet, there are some shipowners who have been *too busy* to personally inspect a motorship.

THE EAST ASIATIC COMPANY'S NEW MOTORSHIPS

Rapid production of the additions to the large motorship fleet of the East Asiatic Company of Copenhagen, Denmark, has been delayed by the shortage of material; but, no doubt, steel will be more plentiful in the near future, so we can expect many of these vessels to be in the water by the end of 1919. Among the bigger of the craft on order, are 6 twin-screw Diesel-driven passenger and freight ships of the folowing dimensions:

Length (B. P.)	485 ft.
Breadth	62 ft.
Depth	42 ft.
Draught	28 ft.
Displacement (approx.)	17,000 tons
Dead-weight capacity	12,470 tons
Gross tonnage	7,750 tons
Loaded speed	12½ knots
Power	6,000 I.H.P.
Bore and stroke	740 mm. by 1,150 mm.
Engine speed	115 R.P.M.
Total number of cylinders	16

There has been some talk of making these ships a little smaller, and so increasing their speed to about 15 knots, loaded.

Six slightly smaller twin-screw motorships also are on order and which have the following dimensions:

Length (B.P.)	420 ft. 0 in.
Breadth	58 ft. 0 in.
Depth	33 ft. 6 in.
Draught	25 ft. 9 in.
Displacement (approx.)	14,000 tons
Dead-weight capacity	9,350 tons
Gross tonnage	6,050 tons
Power	4,000 I.H.P.
Engine-speed	100 R.P.M.
Bore and stroke	740 mm. by 1,150 mm.
Total number of cylinders	12

In addition to these motorvessels, there are eight of a little less tonnage also on order.

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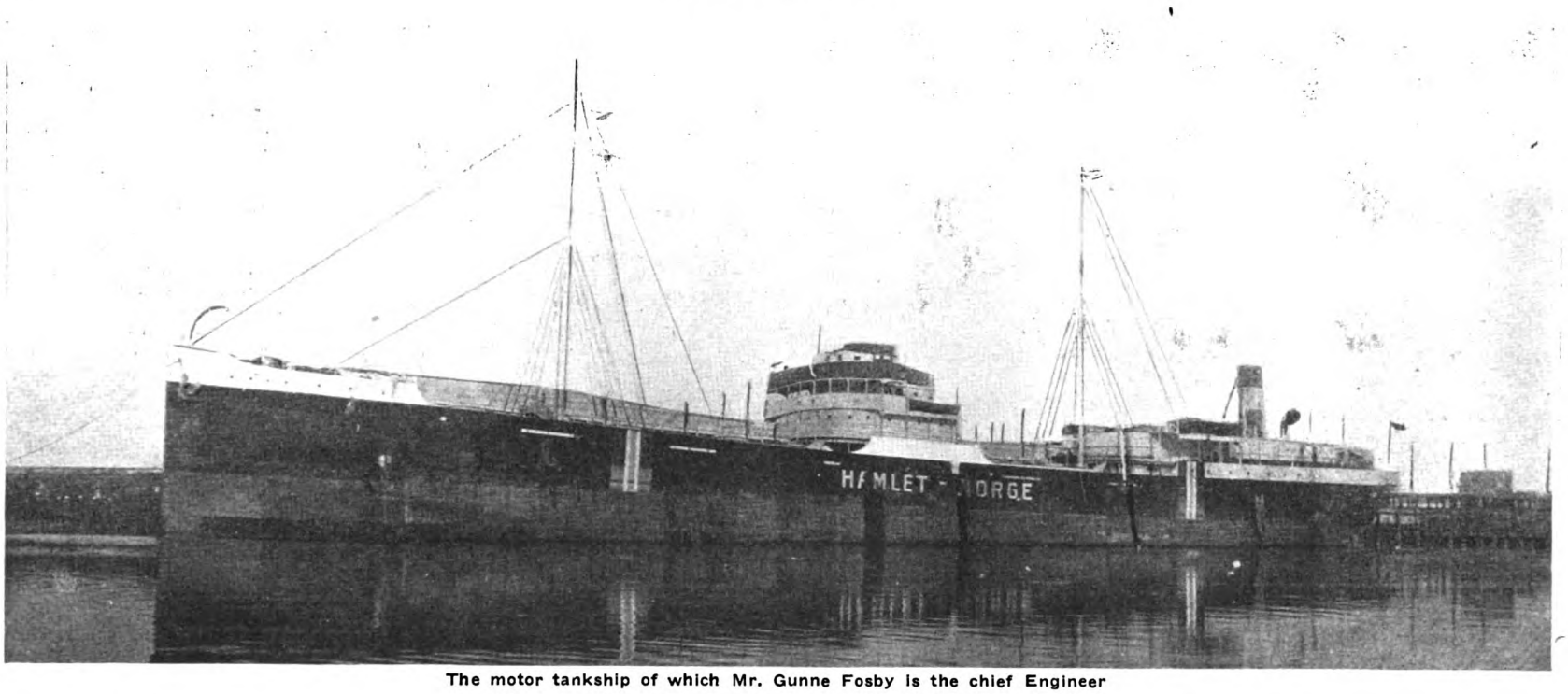


The motor tankship of which Mr. Gunne Fosby is the chief Engineer

Suggestions for Two-Cycle Type Diesel Engine Installations for Merchant Ships

My Personal Experiences with a High-Powered Set

By CHIEF-ENGINEER GUNNE FOSBY, of the M. S. "HAMLET"

READING the various statements about Diesel engines one would believe that the two-cycle system has been put in the second place only. That is a mistake, because the two-cycle motor with scavenging-air ports is by far the simplest engine and therefore it should be the most reliable.

Regarding cracked cylinder-covers and pistons, there is no reason why a two-cycle engine should break-down sooner than a four-cycle of the same horsepower. Practically the same amount of fuel is used and the scavenging-air in a two-cycle engine will cool the cylinder and piston quite as much as the suction-stroke in a four-cycle.

However, it must be taken into consideration that the majority of cylinder-heads and pistons on the two-cycle engine have a rather irregular shape, also that the cooling-water space is greater; therefore, special arrangements must be made to get an even circulation all over the cooling surface; there must not be any place where the water can come to a stand-still and thus allowing dirt to settle and isolate the cooling-surfaces.

When the sea-water is very cold it is not at all to be recommended to throttle the circulating water. But it is rather important that the engine cylinders always should get the same amount ot cooling water, because if they do not, the circulation will be very weak and it will be difficult to distribute the water to all corners of the cooling-space.

To remedy this, there must be return-pipes from the outlet of the cooling-system, so part of the cooling-water can return to the circulating-pumps and temper the cold water. By throttling the return-water the most desirable temperature can be obtained, and at the same time there will be a powerful circulation to keep the dirt from setting on the ports and cooling-surfaces.

In a steam-boiler where the circulation is bad, there will be unnecessary strain in the material, leaks and all kinds of trouble; and for similar reasons there must be taken special pains in getting a good circulation in a motor-cylinder where the material is less flexible and temperatures and pressures much higher.

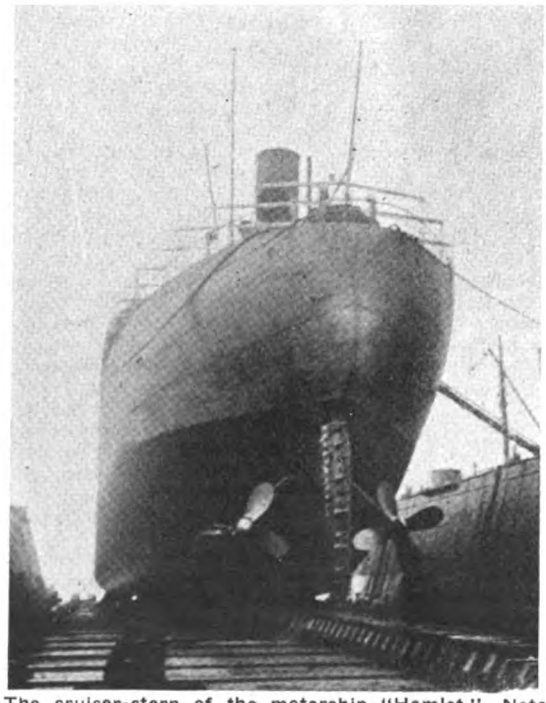
As regards economy in fuel consumption; in my opinion a two-cycle engine ought to be quite as economical as a four-cycle. But the engines must be constructed for a lower number of revolutions (80 to 100 per minute) so the scavenging-air gets sufficient time to wash the burned gasses out and fill each cylinder with clean air for the next combustion. A low number of revolutions is also more economical for the propellor, and the bearings will wear less.

The two-cycle engines of the "Hamlet" turns at 102 revolutions per min. and consumes 0.136 kg. pr. I. H. P. or 0.210 kg. pr. B. H. P.

After a run of 430 days (totalling 102,500 miles) the wearing in the main bearings of the Hamlets' motors proved to be 0.6 m/m; in the crank and crosshead bearings the wearing has been less than 0.1 m/m. These engines have worked for 16 months without any of the last mentioned bearings being touched. [Marine steam engineers please note.—Editor, "Motorship."]

Of course, this is not the result in every case, yet the two-cycle system possesses all the advantages of the four-cycle. Where a high number of revolutions are desired the four-cycle may be more economical, as the combustion will be better because it will always get the exhaust-gases well washed out providing the valves are big enough. A fast-running four-cycle motor naturally will be lighter in weight than a slow-running two-cycle; a fast-running two-cycle generally has less efficient combustion.

There is one thing a motor-engineer must pay special attention to. Never force the motors too hard except when absolutely necessary. It is very easy to open-out on the fuel regulator to race another ship to reach a tidewater and so on. But, the success of this may easily be paid for in cracked cylinder-heads and ruined bearings, and it is quite safe to say that many a motor engine has got its first defects in that way. A steam-engine cannot be "forced" to such an extent as a motor, and this the engineers know; consequently, steam machinery is less often exposed to such break-downs. [A good Diesel engine is capable of at least 40% overload, but it is risky to use the power.—Editor.]



The cruiser-stern of the motorship "Hamlet." Note damaged port propeller.

Forced lubrication is to be preferred and the motors should be inclosed; then an abundance of lubricating-oil may be supplied without much loss. With sufficient bearing surfaces the wearing then will be slight and there will be no danger of the bearings going hot, even tho they cannot be seen all the time.

It is essential that there must be a large setting-tank through which the lubricating-oil can pass after being used so water—if any—and dirt can be given sufficient time to settle. Afterwards the oil should be passed through filters to be cleaned of waste and lighter floating substances. With inclosed motors it is far easier to keep the oil and engine clean.

Where telescoping-pipes are used for piston-cooling, they should be fitted on the outside ot the casings, in order to avoid leaking water from mixing with the lubricating-oil. [The arrangements on the latest Burmeister & Wain & Werks-poor engines are excellent.—Editor.]

Marine motors ought to be built as simple as possible; just the working-cylinders and one main-compressor worked by a crank on the end of the main shaft. There are several designs where all the auxiliary functions are performed by the main engine; but this arrangement gives plenty of opportunities for trouble; for instance, if a compressor, circulating-pump or any other of the gear gets out of control, it will be necessary to stop the main engine to get any little part fixed.

Solid injection of the fuel-oil would be desirable, then the high-pressure compressors could be done away with and only the working cylinders with their gear and fuel-pumps would be required. The scavenging-air could be supplied from an electrical-driven blower as there is only required a pressure of 0.2 kg. [This has been adopted with the Sulzer and the Weiss engines.—Editor.]

All auxiliary machinery (circulating pumps, forced lubricating, etc.) are the best driven by electricty. An electro-motor can work the various pumps from one shaft, and with two complete sets of pumps the main engines would not need to be stopped should a pump get out of order.

The cooling-jackets on motors must be filled up before starting the engines and the water ought

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to circulate for a while after the engines are brought to a stop. This can only be done where separate pumps are installed. The starting air-compressors too, should be electrically driven.

Machinery of this design needs powerful Diesel-driven dynamos; but, the same dynamos may be used when in port to drive the windlass, winches, etc.

Let me from my personal experience state that Diesel-machinery, when properly built and operated, surely will equal steam machinery both as regards reliability and life time. It also requires a smaller engine-room staff and it saves about 2/3 of the weight of bunkers-fuel.

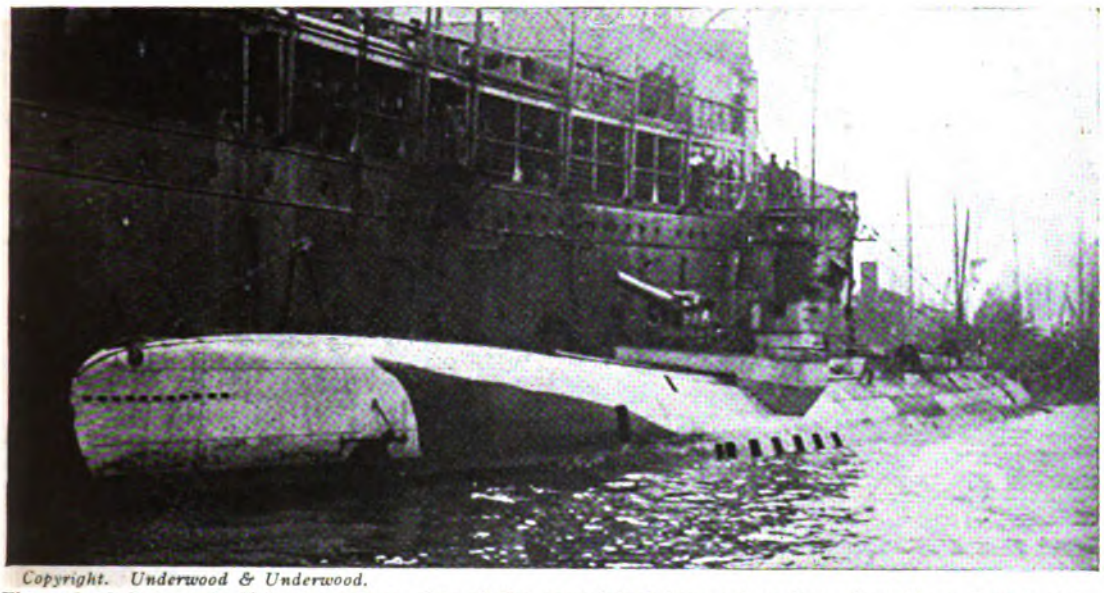
Compared to steam-engines, Diesel-motors are relatively much the safer to work with in regards to accidents; there are no steam-pipes or boilers to burst and scald the engine-room staff to death, or send the ship to the bottom of the seas. The reason of the few explosions which have occurred are most probably to be sought in faulty construction, or gross carelessness from the engine-room staff, and it is to be hoped that no more will happen in the future.

SHIPBUILDING ON THE WEST COAST OF THE U. S. A.

(From Report of the U. S. Shipping-Board)

The way in which the West has plunged into the job of shipbuilding, is one of the inspiring things of the war. When the sudden call came for this nation, whose flag had almost disappeared from the seas, to build an enormous number of ships and to build them as quickly as possible, the Pacific Coast which owned but a few shipyards, figuratively threw off its coat, rolled up its sleeves and went at it. Up and down its long length of coast line it could muster only 23 yards. It rapidly established thirty more, brought into the 53 the brawn and muscle of the Pacific slope, and the result—but wait a minute.

There were, on September 1st, 203 shipyards with 1,020 ways in the country, most of them now



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The end of Germany's U-boat warfare. One of the very latest type submarines alongside a British ship in a British harbor. We suggest that one of these submarines be sent to the U. S. A. in order that American engineers may study her Diesel-engines; then out of bad will come good.

products of the war. In September the various yards made delivery of 74 ships aggregating 362,635 deadweight tons, a world record. Into this record stepped the hustling Western yards with a quota of 37 completed vessels aggregating 209,605 deadweight tons, more than one-half the combined output of the Atlantic, Gulf and Great Lakes shipyards.

The Seattle yards of the Skinner & Eddy Corporation lead all shipyards in deliveries of completed vessels. The Skinner & Eddy Corporation delivered the first five contract steel-vessels to the Shipping Board, among them the "West Lianga," a freighter of 8,543 deadweight tons. This vessel was completed in 78 calendar days, which still stands as the record of a vessel of that tonnage.

This corporation has built and completed in less than a year 22 steel vessels, 21 cargo and 1 tanker, totaling 194,895 deadweight tons, or about one-eleventh of all the new vessels delivered to the Shipping Board. On October 5th, the manager of this corporation announced that henceforth the corporation was prepared to launch and deliver one ship a week. From the time the present United States Shipping Board took charge of and established shipyards in the United States, that is in August, 1917, down to October 1st, its program of construction has increased the sea-going American Merchant Marine by 408 vessels of 2,376,362 deadweight tons. Of this tonnage, the Pacific Coast contributed 162 vessels of 1,149,685 deadweight tons, or over 39 per cent. in the number of vessels, and over 48 per cent. in deadweight tonnage.

AUXILIARY FISHING SCHOONER "GRACE & RUBY"

The schooner "Grace & Ruby," launched during August last at the yard of W. D. Sweeney, Yarmouth, N. S., is to be equipped with auxiliary motor power. She is of 85 tons net register, is 112 ft. long, and will be used in the fishing industry.

BRITISH SHIPBUILDING, AND SHIP LOSSES

In the nine months, from January, 1918, to September, 1918, inclusive, there were placed in service of the British merchant marine, ships to the approximate total of 1,900,000 tons dead-weight capacity, or, to be exact, 1,174,641 gross tons.

During the same period Great Britain lost by submarines and mines approximately 2,016,814 tons d.w.c. in merchant ships, or, to be exact, 1,833,468 gross tons.

This gives a net war-loss for the period of a little over one-hundred-thousand tons dead-weight capacity. Had all the new ships built been motorships, instead of only a limited number being Diesel-driven, the cargo-capacity total of the new ships would have been just about level with that of the greater number sunk. The figures of the buildings and losses are from official sources, having been announced by the Secretary of the British Admiralty. [The British losses in October, 1918, were 83,952 gross tons.]

British merchant tonnage losses were 9,031,828 gross tons from the beginning of the war to October 31, 1918, according to an official statement issued. New construction in the United Kingdom in the same period was 4,342,296 gross tons, purchases abroad were 530,000 gross tons, and enemy tonnage captured was 716,520 gross tons. The net loss was 3,443,012 tons gross, or approximately 5,508,800 tons d.w.c.

Photo. S.I.M. French Ministry of Marine.

An old steam trawler converted to Diesel-engine power and used by the French navy for submarine patrolling and convoy work.

ITALY'S NAVAL TANKS

We understand that the "naval tank" used by the Italian Navy to enter the harbor of Pola and blow up the Austrian battleship "Viribus Unitis" early in November, 1918, was a Diesel motor-driven vessel about the size of the Ford "Eagle" patrol boats. This "naval tank" was in charge of Commander Rossetti and Lieut. Paolucci.

OIL-ENGINED AUXILIARY "MAPLE LAND"

Shortly before the date set for launching the three-masted wooden schooner "Maple Land" at the Annapolis Royal Shipyard, Nova Scotia, it was decided to install oil-engine power for auxiliary propulsion to give her a speed of 10 knots without the sails set. She is a little over 1,000 tons dead-weight capacity and has the following dimensions:

Length O. A.	180 ft. 0 in.
Length of keel	145 ft. 0 in.
Breadth of beam	35 ft. 0 in.
Depth of hold	13 ft. 0 in.
Gross tonnage	665 tons
Sail area	3,000 canvas yards
No. of screws	Twin

The name or power of the two oil-engines being installed has not been announced.

CHANGE IN FAIRBANKS, MORSE & CO.

Following a recent meeting of the directors of Fairbanks, Morse & Co., of Chicago, with branch houses located in principal cities all over the country, Mr. C. H. Morse, Jr., president, announces several new and important changes covering the active management of the business.

Mr. R. H. Morse has been elected vice-president in general charge of purchasing and traffic. Mr. Morse's connection with the firm covers many years of varied experience in both sales and manufacturing departments, and he continues his duties as a director of the company.

Mr. C. W. Pank rises from general director of sales to vice-president in charge of sales of all factory products. Mr. Pank's growth with this organization has been unusually marked since his start with Fairbanks, Morse & Co., some thirty-three years ago, as a stenographer. His activities through these many years have included practically every branch of sales and affiliated effort.

Mr. W. S. Hovey, formerly general manager of the large Fairbanks-Morse Manufacturing plant at Beloit, Wis., has been elected vice-president in charge of general manufacturing at all factories. Mr. Hovey has been with this concern for a number of years, aiding in its development through the application of modern principles of designs and manufacture to many of the popular Fairbanks-Morse products.

Mr. W. E. Miller becomes vice-president and treasurer instead of first vice-president. Mr. F. M. Boughey retires from the position of treasurer to become secretary and comptroller.

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New Device for Cleaning Lubricating-Oil

A Simple and Efficient Machine Produced by the De Laval Separator Co.

UNFORTUNATELY some of the motorships built in this country have not been so efficiently designed and laid-out as they might have been, resulting in loss of a considerable amount of economy that otherwise would exist. This, as previously indicated, has been due to lack of experience in some cases, and to false-economy of construction in others. A few days ago we had the opportunity of seeing the log of a 320 b.h.p. steel motorship that is considerably underpowered. To our astonishment the lubricating-oil consumption varied from 25 to 45 gallons per day. The owners say this is due to underhanded work

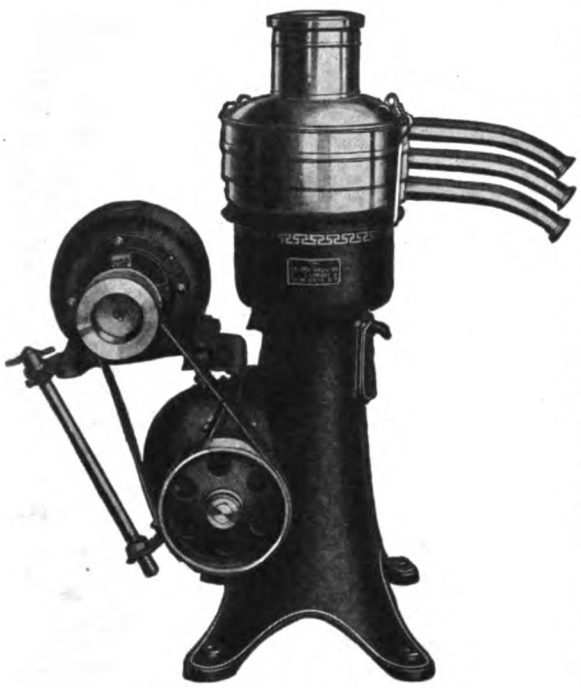

Fig. 1—Motor-driven oil purifier

on the part of the engineers of the ship, while the engineers say that the ship only has an oil-filter capable of handling 7 gallons per day; consequently most of the dirty oil has to be thrown overboard instead of being used over again.

On the other hand, the lubricating-oil consumption of the 4,000 I.H.P. motorship "Bullaren," described elsewhere in this issue, is but 12 gallons per day. A tremendous difference considering the engine powers of the two ships. The "Bullaren," we may mention, is equipped with a De Laval oil-separator.

Recently a careful study has been made of the oil-cleaning question by the De Laval Separator Co. of New York with excellent results, and they have produced a machine which, after inspection, we can recommend to every shipowner, and, as is well known, "Motorship" is very cautious regarding making such recommendations to our readers.

The machine consists essentially of a cast-iron frame occuping less than 2 sq. ft. of floor space, and provided with suitable bearings for supporting a vertical spindle which carries the purifying bowl at the upper end. The weight of the bowl and spindle, together with any thrust due to driving, is taken by two thread-wheels, on which the polished end of the spindle rests. The bowl spindle is held in an upright position by a flexible spring-collar surrounding the upper bearing. The spring-collar permits a small amount of lateral motion and allows the rapidly revolving bowl to assume an unrestrained position. Surmounting the bowl are three covers, arranged to serve for overflow, oil and water discharge, respectively At the top of the overflow cover is located the regulating cover into which the oil to be purified flows. This cover is provided with a removable strainer to eliminate the larger particles of foreign matter from the oil before it reaches the bowl. The purifier is either motor-driven or steam-driven. The motor-driven type is here illustrated, Figure 1.

The capacity of the purifier is 100-125 gallons per hour. The weight is 750 pounds net. It is also made in a smaller size, capacity of which is 35 gallons per hour; the weight is 390 pounds net.

When the bowl is revolving at the proper speed (7,000 revolutions per minute) the oil to be purified enters the central tubular feed shaft and passes downward and out through slots into the channels in the distributor. From thence it passes through the holes in the bottom of the distributor to the disc-separating space in the bowl. Here, due to centrifugal action, separation takes place. The material which is heavier than the water, such as carbon, sand and metallic particles, is thrown outward to the periphery of the bowl, and held there in the sediment pocket by centrifugal force. The water, being heavier than the oil, also passes outward and upward along the outer edge of the discs to the discharge outlet.

The oil passes inward between the discs toward the central shaft, thence upward to the discharge outlet. Surrounding the outlets are the liquid cover and the sludge cover, so arranged that centrifugal force throws the liquids from the outlet openings into the covers, whence it is conducted to the proper receptacles by the attached spouts. If at any time the bowl should become clogged by a large amount of dirt, so that the liquid could no longer flow through, the inlet tube would fill up and overflow. By using a third cover the overflow is kept separate and acts as a warning signal that the bowl needs cleaning.

With some marine oil-engines the prime source of trouble is the accumulation of carbon which rapidly lessens the lubricating qualities of the oil. When it becomes too foul for further use it has heretofore been the practice to pump it overboard and replace the amount pumped overboard with new oil. This practice necessitates the wasting of a great amount of oil daily, on some vessels amounting to as much as 0.25 quarts per horsepower. This requires the carrying of a large amount of oil, the space for which could more profitably be devoted to cargo. It is claimed that the De Laval method will remove all the carbon as well as other impurities, so that it is only necessary to carry a relatively small amount of oil which can be used over and over again indefinitely.

Other impurities, such as particles of metal, dust and grit which come from the wearing surfaces and from the combustion chamber and in various other ways are introduced into the oiling system, are also removed. The method will eliminate core sand and pipe scale, which are particularly in evidence in new installations.

Some of these motors have pistons cooled by water circulation. In this case it is inevitable that some water will find its way into the oil. The presence of water, especially of salt water, in the machinery has always caused considerable trouble because of the rusting of the parts; its admission to moving surfaces causes uneven lubrication, resulting in uneven and excessive wear. The makers claim that the De Laval separator will remove all the water from the oil. After purification the used oil is as good as new; in some respects better because of its higher viscosity.

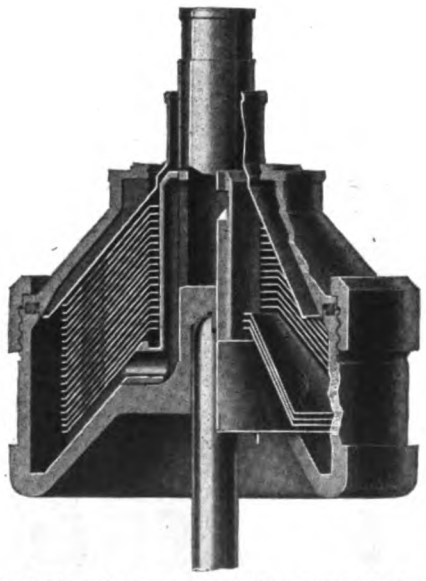

Fig. 2—Sectional view of revolving bowl of oil purifier

HOLLAND'S MOTORSHIP BUILDING INDUSTRY

According to official figures, eight motorships were completed and delivered to Holland during the first six months of 1918, and at the end of June last there were 18 motorships under construction. Some of them, presumably, were small vessels.

AN OBJECT LESSON

When the East Asiatic Company abandoned steamships in favor of motorships, they sold their fleet of steamers, (with the exception of three large freighters that they converted to Diesel-motor power) to the Orient Steamship Navigation Co. Recently the Orient S. N. Co., ordered a Diesel motorship from the Nakskow ship yard, Denmark. This vessel will be of 8,700 tons d.w.c., and will be engined by the New Danish Diesel Motor Works Ltd. of Copenhagen. The latter is a company formed by the same financial interests as are behind Burmeister & Wein, presumably to encourage friendly rivalry and development. The Holeby Diesel Engine Works and five shipyards were incorporated in the new concern. The United Steamship Company also is interested in the enterprise to which reference previously has been made in "Motorship."

BRITISH CONCRETE MOTOR VESSEL

On Nov. 19th the British concrete motorship "Molliette" was launched at Faversham Creek, Upper Brents, England by James Pollock & Sons Ltd. "Government Ale" was used for the christening ceremony. The "Molliette" is a straight-lined and straight-framed vessel built for sea-going purposes and is 131 ft. long by 25 ft. breath, 11ft. 9 in. depth, and 9 ft. 9 in. loaded draught. She is propelled by a 120 b.h.p. Bolinder surface ignition type heavy-oil-engine, giving her a speed of 7 knots in calm weather, without using the canvas carried. She is a three-masted schooner and carries 320 tons of cargo, and she will be used in the coastwise trade. Her owner is Mr. A. J. W. Pryke of Gravesend, near London. Mr. W. J. Wragge, A. M.-I. N. A. is the manager of the ship yard.

FAR EASTERN PASSENGER AND CARGO MOTORSHIP

There was launched at the end of September last a passenger and cargo motorship of 2,400 tons d.w.c. at the ship yard of the Anglo-Chinese Steamship Company, Tanjong Rhu, Singapore, Straits Settlements. This vessel is one of the largest wooden craft ever built in the Far East, and she has accommodation for 20 first-class passengers in large state-rooms and 300 third-class passengers on the main deck aft. Her propelling machinery consists of two direct-reversible Skandia surface-ignition oil-motors, which are said to drive the ship at 10 knots. For handling the cargo, there is a vertical donky-boiler at the fore end of the boat, which supplies steam to six cargo winches. There are three cargo hatches. The steering-gear and the anchor windlass also are steam-driven. The ship is 230 ft. long bp., by 42 ft. moulded breadth, and 22 ft. depth of hold. The bunkers have a capacity of 1,400 barrels of oil.

"FLIVVER" BARGES

Recently it was reported that when Henry Ford completes the "Eagle" boats, he will use the plant and about 5,000 men for building canal barges. These craft are to be of 1,500 tons d.w.c., and some will be motor-driven for towing other barges, and they will be used for transporting tractors and automobiles to the East coast. The type of engine to be installed in these barges has not been announced. Perhaps Mr. Ford will use his tractor or automobile engine!

THE AUXILIARY SCHOONER "MARYLAND"

The two 320 b.h.p. surface-ignition type oil-engines have been removed from the auxiliary schooner "Maryland," owned by the Texas Company of New York, and in their place two larger oil-engines are being installed. These motors are McIntosh & Seymour, four-cycle type, reversible Diesel-engines of 500 b.h.p. each. This is a more logical size for the vessel in question, and doubtless her efficiency will be greatly increased.

Frequently "Motorship" has pointed out that many American motor vessels are under-powered, and in practically every case we have definitely referred to our recommendations have proven correct.

CANCEL MANY WOODEN SHIP CONTRACTS

U. S. Shipping Board Voids All Contracts Where Not More Than $200,000 Has Been Spent on a Ship

Cancellation of all outstanding contracts for construction of wooden ships where builders have not spent more than $200,000 on a ship has been determined upon by the U. S. Shipping Board. This applies to yards on the Atlantic, Gulf, and Pacific coasts. Contracts for 160 ships of this type were suspended recently, and many of these are affected by the decision, though officials of the board would not attempt to estimate the number at the time the above announcement was made.

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Our Readers' Opinions

(The publication of letters does not necessarily imply Editorial endorsement of opinions expressed.)

THE M. S. PENSACOLA

To the Editor of "Motorship,"

Sir:

I am so interested with "Motorship" in its efforts to show all advantages brought to the shipping by the oil-engined motorship navigation, that I am very pleased to send you these few lines about the experiences I made myself on my auxiliary schooner "Pensacola." You gave some particulars about that ship in your number 6th, of June, 1918.

Even with her two 60/72 HP. Fairbanks-Morse oil engines she had a pretty quick run last July from Pensacola, Fla., to New York in 13 days, including the three first days all stopped in order to settle and fix new engines, bearings, etc., that could not be avoided; but, for ten days we had not any trouble with the engines.

Having left New York on last August for crossing, we encountered bad weather, the ship being disabled of her rudder, then we entirely relied upon the motors to come back safely, as they did work well in spite of rough seas, and water in the engine room.

I am convinced that the era of oil-engined motor-ship has arrived, provided the engines are not used for training new engineers during normal trips, as has been so badly experienced. I enclose a picture of the schooner "Pensacola."

Yours very truly,

V. Le Toumelin (French Capt.)

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PROGRESS OF ENGINEERING AND MOTOR-SHIPS

To the Editor of "Motorship,"

Sir:—

Referring to the editorial in the November, 1918, issue of "Motorship," I believe that inventions and improvements come as fast as the world will accept their value. I expect to see the oil-engine fully take the place which belongs to it, as the reciprocating steam-engine and the turbine did in their turn, depending in large degree on the enterprise and industry of the builders in improving their product and in proving to the world economy in operation.

About 1892 we were told that steam locomotives were doomed, that we had better quit building them and proceed at once to construct electric locomotives only; but steam locomotives are still being built, although the building of electrics has increased immensely.

I think you have about hit the nail on the head in the italics which precede the editorial, namely:

"The oil-engined motorship has arrived! It is such a pronounced economy that it was bound to come. Nothing could stop it! And all obstacles have been removed as fast as they arose. The

The auxiliary "Pensacola"

law of progress has seen to that. Very strong prejudices stood in the way of steam. But, one after another they were swept aside and steam reigned triumphant for a century. Steam now has had its day! Its zenith has passed, and gradually but surely it is being superseded by the economical internal-combustion power. America, the most important oil-producing country, is to be the greatest motorship-owning nation. Let us all co-operate and assist to make that day soon."

Yours very truly,

ALBA B. JOHNSON,
President.
The Baldwin Locomotive Works.
Philadelphia, Pa.

THE COOLING OF PISTONS

To the Editor of "Motorship,"

Sir:

I am a subscriber to the "Motorship" and, being a marine-engineer of experience, I find your articles most interesting. I wish to refer to the article in the November, 1918, issue entitled "Visit to a Large Danish Motorship," describing the M. S. "Chile." It is the statments made by Chief-Engineer F. W. Moller regarding the use of salt-water cooling for the piston that I am chiefly concerned about. I, myself, believe that salt-water is better than oil for the cooling of pistons. That is, if the manufacturers in this country would follow along the lines of construction of the "Chile's" engines.

Since the engines are about 60 lbs. higher in compression than the average type of Diesel engines, it is only reasonable to believe that the temperature is much higher; making it possible to carry a much lower discharge cooling-water temperature than could be carried with lower compression. The lower temperature will not allow the salts to form within the piston. The lower the compression pressure the longer the heat units must be retarded or retained within the cylinder to insure the necessary combustion; the hot-ball type of oil engine demonstrates that prinicpal, so the cooling fluid must have then, a higher discharge temperature. The forming of salts from these high temperat res, has brought about the oil-cooling of pistons.

I take it, that when speaking of the discharge water being 45° centrigrade, that it is 45° C. difference between the intake and discharge water, which range can only be held and controlled by a large cooling surface and supply control, so lacking on many makes of American built engines.

Yours very truly,

R. P. MASON.

Hotel Clark,
San Francisco, Calif.

[To avoid salt deposit the pistons also must be designed to avoid pockets that will hold "dead" water and so collect salt, etc.—Editor.]

FUEL-OIL AT PANAMA

According to our British Contemporary "Shipbuilding & Shipping Record," "the Panama Canal authorities from September 1st. have raised the price of fuel-oil to $2.50 per barrel at Balboa, and to $3.00 per barrel at Cristobal. The price of "Diesol" (Union Petroleum Company's internal-combustion-engine fuel) was at the same time, increased to $4.00 per barrel at Balboa, and $4.50 per barrel at Cristobal. Only small quantities of this fuel can be obtained at Cristobal, the main supply being at Balboa." However, the new oil-fuel stations erected at both ends of the Canal by the Asiatic Petroleum Company now are in operation, so we can look forward to cheaper oil in the future. In normal times it pays to operate motorships in competition with steamers when oil-fuel is as high as $10.00 per barrel. At the present time it would pay with oil at $30.00 per barrel, so the price of oil will have comparatively no retarding effect upon the development, and successful operation, of the motorship.

FUEL-OIL FOR MOTORSHIPS

With fuel-oil stations all over the world, the Royal Dutch Petroleum Company and its associated companies soon will make a strong bid to lead the market in furnishing fuel to motorships and oil-fired steamers. The Shell Transport and Trading Co. and the Royal Dutch together have a capital of $500,000,000.00. They have 200,000 barrels of good oil in store in Mexico, and their new pipe line from Cushing to St. Louis, Mo., soon will have a capacity of 24,000 barrels per day, and this refinery may supply part of the Middle West with automobile gasolene. It looks as if the old war with the Standard Oil may be resumed, in which case the world can look forward to cheaper fuel-oil and gasolene in a year or so. The Royal Dutch now are producing 1,200 tons of Taraken crude-oil daily, a clean but very heavy oil used with good results on a number of motorships trading in the East. At their new refinery in Curacao, there is being refined 1,000 tons of Venezuelan oils per day, but we presume that this will only be used for the British markets. Low transportation costs are effected by their numerous oil-carrying motorships.

The Royal Dutch-Shell combination has just purchased important oil land holdings in Mexico to the extent of 100,000 acres, including producing wells and storage facilities. The Corona Petroleum Co., a subsidiary, will operate this well. The British Government is a big stockholder in the Royal Dutch Petroleum Co..

THE IMPORTANCE OF OIL DURING THE WAR

Readers of "Motorship" will recall how in 1917, for many months we were the only publication that advocated the importance of rapidly building a large number of oil-carrying tankships, and at the same time we pointed out the great bearing oil had on victory. Speaking at a dinner given on November 21st last, by the British Government to the Interallies Petroleum Committee, Lord Curzon declared that the Allies' cause had been "floated to victory on a wave of oil," the council having handled 91,000,000 barrels of liquid fuel. In December, 1916, he said, the oil situation was so critical that the British Fleet had to restrict operations. "Motorship" indicated that the Germans would strive to sink all the tankers, and this afterward proved to be correct, as many oil-carrying ships were sunk. The critical period was covered, however, by 7,000,000 barrels of oil carried in the double bottoms of ordinary cargo-vessels.

SCOTTISH SHALE OIL

The production of shale-oil in Scotland has reached 70,000 gallons annually, in addition to 60,000 gallons of ammonia. The quantity is so small that it hardly seems worth working.

OIL PRODUCTION IN THE U. S. A.

Oil figures for 1917 recently have been issued, the world's production having been 500,651,000 barrels of 40 gallons per barrel, of which 335,315,000 were produced in the U. S. A. and 55,292,770 barrels in Mexico. Production in the Dutch East Indies was hampered by lack of drilling machinery and storage tanks, but it amounted to 12,928,955 barrels. The war also seriously lowered the Russian production. Since 1857 no less than 7,000,000,000 barrels, approximately, of oil have been extracted from old Mother Earth, and of this 60 per cent. has come from America. Will America be able to maintain the lead, or will she soon run dry? Let us play "safety first" and build motorships, and so save two-thirds of every gallon of fuel-oil used under the boilers of oil-fired steamers, and let us make oil from our coal for the same purpose.

THE WERKSPOOR SUBMARINE ENGINE

Through a typographical error—not our own—the maximum power of the Werkspoor submarine-engine was given as 600 b.h.p., whereas it should have been 550 b.h.p. This, of course, automatically changes the weight per b.h.p.

CONVERSION OF THE "ANNA"

At Whitstable, England, an interesting conversion job recently has been completed by the Kentish Shipbuilding and Engineering Co. This was the old Russian sailing-ship "Anna" which was wrecked at Weymouth a year ago. The hull has been rebuilt and made as auxiliary power-vessel, two Invincible surface-ignition oil-engines having been installed. On trial a speed of six knots was attained on a consumption of 0-5 pint (British Imperial standard) of oil-fuel per b.h.p. hour. The "Anna" is of 650 tons d.w.c. The work was supervised by Mr. J. H. Morris, of the above company.

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"Motorship" Illustrated Patent Record*

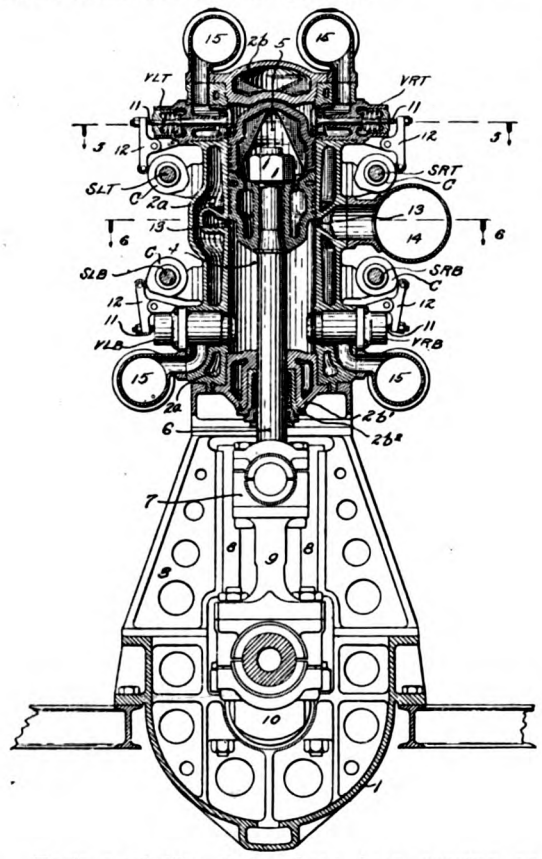
Selected Abstracts of Recent Published Patents of Internal Combustion Engines

Copies of original specifications may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."

*Compiled and described by H. Schreck, Member American Society Mechanical Engineers

1,240,827. Sept. 25, 1917. Double-acting two-cycle Engine. G. C. Davison and J. W. Anderson of New London, Conn., Assignors to Electric Boat Co., of New York, N. Y.

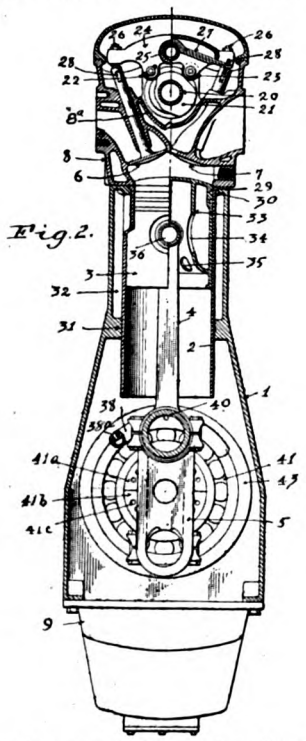
This invention relates to a two-cycle Diesel-engine whose cylinders have combustion chambers at both ends, each with its complete set of valves. These valves each set of which comprising two scavenging valves and two fuel valves are arranged horizontally and are actuated by camshafts extending across either side of the cylinders.



Engines of like design have been running and tested in Europe for quite a number of years although in difference to the reported invention the valve of the upper combustion chamber were arranged vertically in the cylinder head.

1,277,742. Sept. 3, 1918. Internal Combustion Engine. H. C. Mummert, of Buffalo, N. Y.

This invention relates to various improvements in the construction of, in particular, high-speed type engines On an engine running at, say 2500 R.P.M. valves which



are merely spring operated are often inadequate and, therefore, the inventor has suggested a special design of positively operated valves. The inlet and exhaust valves 6 and 7 are being operated by the rocker arm 24, which is pivoted on a longitudinal shaft 25, and which is actuated positively in both directions by double-cams. On the return motion of this lever the leaf springs 27, whose ends engage with the stems of the valves and which are resting over the shaft 25, secure the proper closing of the valves.

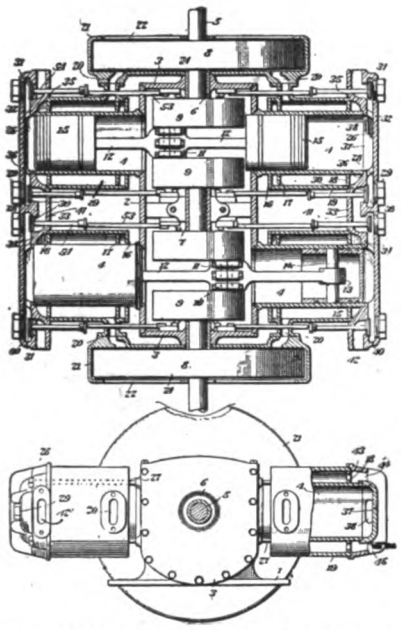
The inventor claims furthermore as an improvement the separate cylinder liners and the kind of webbing of the piston 33. The latter is forming an air chamber which is intended to keep the heat away from the wrist pin and the webbing itself to lead the heat of the piston crown to parts of lower temperature and under indirect cooling.

The main bearings, transmission shaft bearings, etc., are ball bearings, which arrangement has been suggested from the point of view of eliminating the scraping and fitting of bearings in case of replacement.

1,270,124. June 18, 1918. Horizontal, Opposed Piston, Air-Cooled Engine. B. H. Davidson of Tampa, Florida.

The object of this invention is to provide an efficient cooling of the engine by means of air, a common cylinder head with air and gas passages for two adjacent cylinders, and a valve-operating mechanism of a minimum number of parts. Two fans which are arranged inside the fly wheels 24 are drawing in the

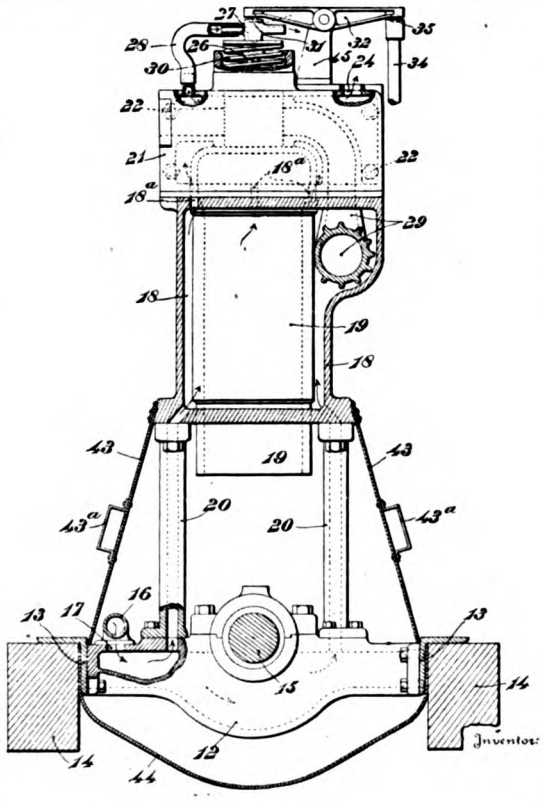
Fig. 1.



cooling air at the cylinder heads between the cooling webs 45, then through the orifices 43, around the cylinders through the jackets 19, and finally through the ports 20, and discharging the air through the holes 22 into the open. The passages 42, which are arranged at the opposite outer ends of the head block, are for the exhaust, and the chambers 41 are the inlet manifolds for the gas and air intake.

1,278,784. Sept. 10, 1918. Internal Combustion Engine. T. L. Sturtevant, of Quincy, Mass., Assignor to Sturtevant Mill Co., a Corp. of Maine.

This invention relates to a combination of a cooling system especially adapted for marine engines, and consists of certain improvements of the Sturtevant



engine as covered by patents 1,164,675., 1,185,951 and 1,186,860. This cooling system provides for the water to pass first through the hollow cross beams of the bed plate, thus providing a thorough indirect cooling of the main bearings, then passing through hollow columns into the water jacket of the cylinder and finally into the exhaust valves. The exhaust manifold 29, is arranged inside of the water jacket of the cylinder.

This combination of cooling system is novel in its kind although it may be mentioned that the passage of the cooling water first through the base plate has been employed for a number of years by The James Craig Diesel Eng. Co., of Jersey City, N. J.

1,279,184. Sept. 17, 1918. Piston. J. G. Vincent, of Detroit, Mich., Assignor to Packard Motor Car Co., of Detroit, Mich.

This invention refers to a construction of piston whose object is to provide for a closer fit between cylinder and piston in order to do away with the piston slap when the engine is cold and yet to allow

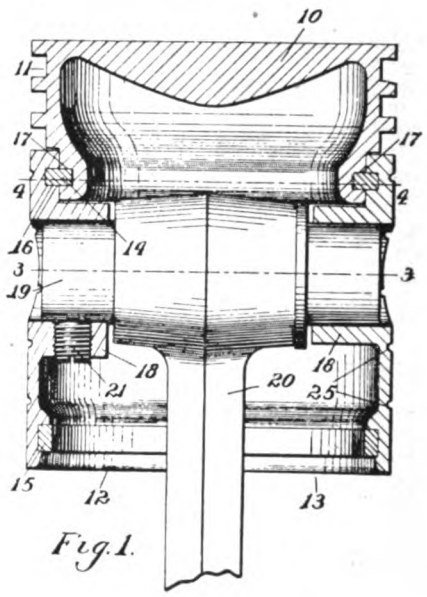
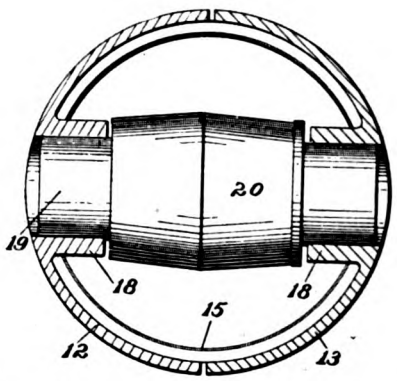


Fig. 1.



the free expansion of the piston when the engine is getting warm. This object has been attained by having a solid piston head and a split piston skirt the two halves of which are being pressed against the cylinder walls by means of the expanding rings 14 and 15.

1,279,775. Sept. 24, 1918. Spray Valve, C. G. Sprado, of Milwaukee, Wisc., Assignor to Allis-Chalmers Mfg. Co., of Milwaukee, Wisc.

This invention relates to a special design of an injection valve on which the mixing chamber is in open communication with the working cylinder, such as are mostly used on horizontal engines. The two check valves 7 and 8, which control the inlet of the fuel as supplied by the fuel pump are located in a

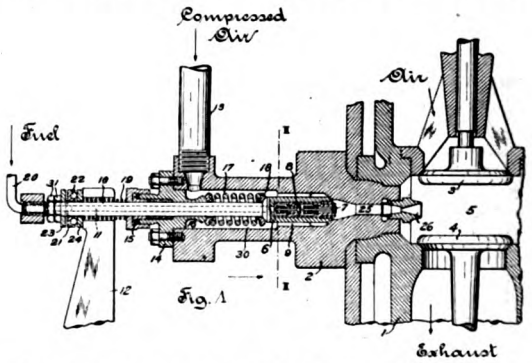


Fig. 1

casing 6. This casing which forms at its outer extremity the valve for the control of the injection air is being actuated by rocker arm 12 periodically to admit the injection air and thus blast into the cylinder and mix with the fuel which had been deposited in the mixing chamber 25.

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